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SECTION 01312

QUALITY CONTROL SYSTEM (QCS)

PART 1 GENERAL

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS-W) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS-Windows, referred to as QCS (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS-W and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS (EM)

EM 385-1-1

U.S. Army Corps of Engineers Safety and
Health Requirement Manual

1.3 HARDWARE/SOFTWARE REQUIREMENTS

1.3.1 Installing the QCS Program

The QCSSetup.exe is the program that you will begin the installation with. Launch the program through your Windows Explorer, the Run command, or however you are used to doing that sort of thing. This is self-extracting file and will create the necessary files and folders and complete the installation and set up your program. The window will close automatically when the extraction process is completed.

The program should install itself, asking only minimal questions. The program will tailor the installation to suit the computer it is being installed on. That is, the program will install a "new" program if one has not already been installed, it will install an "update" if the program is already installed on the computer and will determine each client or server requirement and automatically install/update what is required. Each screen and instruction is shown on the following pages.

1.4 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on 3-1/2" high-density diskettes or CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.5 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

IBM-compatible PC with 500 MHz Pentium or higher processor

128+ MB RAM for workstation / 256+ MB RAM for server.

1 GB hard drive disk space for sole use by the QCS system.

3-1/2 inch high-density floppy drive.

Compact Disk (CD) Reader 8x speed or higher.

SVGA or higher resolution monitor (1024x768, 256 colors).

Mouse or other pointing device.

Windows compatible printer. (Laser printer must have 4 MB+ of RAM).

Connection to the Internet, minimum 56k BPS

Software

MS Windows 98, ME, NT, or 2000.

Word Processing software compatible with MS Word 97 or newer.

Latest version of: Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher.

Electronic mail (E-mail) MAPI compatible.

Virus protection software that is regularly upgraded with all issued manufacturer's updates.

1.6 RELATED INFORMATION

1.6.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.6.2 Contractor Quality Control(CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.7 CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.8 DATABASE MAINTENANCE

The Contracting Officer the Contractor shall establish, maintain, and update data for the contract in the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The QCS database typically shall include current data on the following items:

1.8.1 Administration

1.8.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.8.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade

shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.8.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.8.1.4 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.8.1.5 EM 385-1-1, Corps of Engineers Safety Manual and RMS Linkage

Upon request, the Contractor can obtain a copy of the current version of the Safety Manual, EM 385-1-1, on CD. Data on the CD will be accessible through QCS, or in stand-alone mode.

1.8.2 Finances

1.8.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by the Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract amount.

1.8.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.8.3 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within

seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.8.3.1 Daily Contractor Quality Control (CQC) Reports.

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.8.3.2 Deficiency Tracking.

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.8.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.8.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.8.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.8.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work

progresses, and shall promptly provide this information to the Government via QCS.

1.8.4 Submittal Management

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns as described in Section 01330, SUBMITTAL PROCEDURES. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. RMS-W will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.8.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Section 01320, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.8.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.9 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.10 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the QCS built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.10.1 File Medium

The Contractor shall submit required data on 3-1/2" double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.10.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, project name, project location, data date, name and telephone number of person responsible for the data.

1.10.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

1.11 MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.12 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

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SECTION 01320
PROJECT SCHEDULE

PART 1 GENERAL

1.1 ELECTRONIC SCHEDULE REQUIREMENT

The Project Schedule to be prepared by the Contractor shall be electronically prepared using software capable of generating a data file in the Standard Data Exchange Format (SDEF). The Project Schedule shall consist of a network analysis system as described below. In preparing this system the scheduling of Construction is the sole responsibility of the contractor. The requirement for the system is included to assure adequate planning in the execution of the work and to assist the Contracting Officer in appraising the reasonableness of the proposed schedule and evaluating progress of the work for the purposes of payment.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 PreConstruction Submittals

Preliminary Project Schedule; G.
Initial Project Schedule; G.
Periodic Schedule Updates

Two copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

Periodic schedule updates schedules shall be submitted together with the monthly progress payment request.

SD-06 Test Reports

Narrative Report.
Schedule Reports.

Two copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

SD-07 Certificates

Qualifications

Documentation showing qualifications of personnel preparing schedule reports.

1.3 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports. This person shall have previously created and reviewed computerized schedules. Qualifications of this individual shall be submitted to the Contracting Officer for review with the Preliminary Project Schedule submission

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel shall result in an inability of the Contracting Officer to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 ELECTRONIC PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manually generated schedules will not be accepted.

The system noted below is capable of generating a file in the Standard Data Exchange Format (SDEF). All electronic data submittals shall be in SDEF. SDEF information is available from the Contracting Officer.

Vendor/System with SDEF support:

Primavera Systems

PRIMAVERA PROJECT PLANNER (P3)

3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

3.3.2 Level of Detail Required

With the exception of the preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days).

3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

3.3.2.3 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and notice to proceed for phasing requirements.

3.3.2.4 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. The responsible party for each activity shall be identified by the Responsibility Code.

3.3.2.5 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

3.3.2.6 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number.

3.3.2.7 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. The bid item for each appropriate activity shall be identified by the Bid Item Code.

3.3.2.8 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity and ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Contracting Officer. The Contracting Officer may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

3.3.7 Extended Non-Work Periods

Designation of Holidays to account for non-work periods of over 5 days will not be allowed. Non-work periods of over 5 days shall be identified by addition of activities that represent the delays. Modifications to the logic of the project schedule shall be made to link those activities that may have been impacted by the delays to the newly added delay activities.

3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days shall be submitted for approval within 20 calendar days after Notice to Proceed is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 90 calendar days after Notice to Proceed.

3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 60 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities which represent work through the entire

project and shall be at a reasonable level of detail.

3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer or to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative, is necessary for verifying the contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.4.4 Standard Activity Coding Dictionary

The Contractor shall submit, with the Initial Project Schedule, a coding scheme that shall be used throughout the project for all activity codes contained in the schedule. The coding scheme submitted shall list the values for each activity code category and translate those values into project specific designations. For example, a Responsibility Code Value, "ELE", may be identified as "Electrical Subcontractor." Activity code values shall represent the same information throughout the duration of the contract. Once accepted with the Initial Project Schedule submission, changes to the activity coding scheme must be accepted by the Contracting Officer.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project:

3.5.1 Data Disks

Two data disks or two sets of data disks containing the project schedule shall be provided. Data on the disks shall be in the Standard Data Exchange Format (SDEF), in accordance with ER-1-1-11, PROGRESS, SCHEDULES, AND NETWORK ANALYSIS SYSTEMS, Appendix A, Standard Data Exchange Format Specification (attached at the end of this Project Schedule specification.

3.5.1.1 File Medium

Required data shall be submitted on 3.5-inch disks, formatted to hold 1.44 MB of data, under the MS-Windows operating system.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the operating system and version used to format the disk.

3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the

Contracting Officer for approval.

3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the critical path(s), a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.3 Total Float Report

A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: Activity

Number or "i-node" and "j-node", Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5 S-Curves

A graph of anticipated earnings (S-Curves) showing cumulative earnings for the duration of the project. The vertical scale shall show earnings/percent complete from 0%-100%. The horizontal scale shall be a time scale showing the calendar months of the project. Three curves shall be plotted on the same graph; the earnings/percent complete based on early finish dates; the earnings/percent complete based on late finish dates; the actual earnings/percent complete to date.

3.5.5.6 Bar Chart

A bar chart covering the previous month's activities and progress, and the planned activities over 3 months projected into the future. The chart shall also include actual and anticipated earnings.

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions,

and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. The following is a minimum set of items which the Contractor shall address, on an activity by activity basis, during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary, and 3) a schedule which does not represent the actual prosecution and progress of the work.

3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract

completion date, he shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request.

The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- a. A list of affected activities, with their associated project schedule activity number.
- b. A brief explanation of the causes of the change.
- c. An analysis of the overall impact of the changes proposed.
- d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions

furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

STANDARD DATA EXCHANGE FORMAT SPECIFICATION

PART 1- GENERAL

1. Application of This Provision: The Standard Data Exchange Format (SDEF) provides a nonproprietary protocol to exchange project planning and progress data between scheduling systems.

2. File Type and Format: The data file shall consist of a 132 character, freed format, "ASCII" file. Text shall be left-justified and numbers shall be right-justified in each field. Data records must conform, exactly, to the sequence, column position, maximum length, mandatory values, and field definitions described below to comply with the SDEF. Unless specifically stated, all numbers shall be whole numbers. Fields containing numbers shall not be zero filled. All data columns shall be separated by a single blank column. The file shall not contain blank lines.

3. Usage Notes: Where appropriate, notes regarding proper usage of systems to support the SDEF have been included in brackets ([]). These notes are included to assist users in creating SDEFcompatible files, given the variety of software systems that support the SDEF.

4. Recommended Systems: Several systems have been tested to determine the accuracy of importing and exporting SDEF files. For information on the current list of recommended systems please contact Mr. Brad James at HQUSACE, (202) 761-5541. Although the currently listed system have been tested other systems may also be acceptable provided those systems correctly import and export SDEF files.

5. SDEF Checker Program: To verify SDEF files meet the specified guidelines download the SDEF Checker utility from the winrms website. Go to <http://winrms.usace.army.mil>, click on the **User Manuals** Link to the left and then click on the **P3 SDEF** Link to the left.

PART 2- SDEF SPECIFICATION

6. SDEF Organization: The SDEF shall consist of the following records provided in the exact sequence shown below:

* Change in POC information.

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Paragraph Record

Reference Description

Remarks

6.a	Volume Record	Mandatory First Line of File
6.b	Project Record	Mandatory Second Line of File
6.c	Calendar Record(s)	Mandatory One Record Minimum
6.d	Holiday Record(s)	Mandatory if Holidays Used
6.e	Activity Record(s)	Mandatory Records
6.f	Precedence Record(s)	Mandatory for Precedence
6.g	Unit Cost Record(s)	Mandatory for Unit Costs
6.h	Progress Record(s)	Mandatory Records
6.i	File End Record	Mandatory Last Line of Disk/File

6.a. Volume Record: The Volume Record shall be used to control the transfer of data that may not fit on a single disk. The first line in every file used to store SDEF data shall be the Volume Record. The Volume Record shall sequentially identify the number of the data transfer disk(s). The Volume Record shall have the following format:

<u>Description</u>	<u>Column</u> <u>Position</u>	<u>Max.</u> <u>Len.</u>	<u>Req.</u> <u>Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1 - 4	4	VOLM	Fixed	Filled
DISK NUMBER	6 - 7	2	√	Number	Right Justified

6.a.(1) The RECORD IDENTIFIER is the first four characters of this record. The required value for this field shall be "VOLM". The VOLM record must appear on the first line of the SDEF data file.

6.a.(2) The DISK NUMBER field shall identify the number of the data disk used to store the data exchange information. If all data may be contained on a single disk, this field shall contain the value of "1". If more disks are required, then the second disk shall contain the value "2", the third disk shall be designated with a "3", and so on. Identification of the last data disk is accomplished in the Reject End Record.

6.b. Project Record: The Project Identifier Record shall contain general project information. Because more than one SDEF file may be required for data transfer between large projects, the PROJ record shall be the second line of the first SDEF file transferred. The PROJ record shall contain information in the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Req. Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1- 4	4	PROJ	Fixed	Filled
DATA DATE	6- 12	7	√	ddmmmyy	Filled
PROJECT IDENTIFIER	14-17	4	√	Alpha.	Left Justified
PROJECT NAME	19-66	48	√	Alpha.	Left Justified
CONTRACTOR NAME	68-103	36	√	Alpha.	Left Justified
ARROW OR PRECEDENCE	105-105	1	A,P	Fixed	Filled
CONTRACT NUMBER	107-112	6	√	Alpha.	Left Justified
PROJECT START	114-120	7	√	ddmmmyy	Filled
PROJECT END	122-128	7	√	ddmmmyy	Filled

6.b.(1) The RECORD IDENTIFIER is the first four characters of this record. The required value for this field shall be "PROJ". This record shall contain the general project information and indicates which scheduling method shall be used.

6.b.(2) The DATA DATE is the date of the schedule calculation. The abbreviation "ddmmmyy" refers to a date format that shall translate a date into two numbers for the day, three letters for the month, and two numbers for the year. For example, March 1, 1999 shall be translated into 01Mar99. This same convention for date formats shall be used throughout the entire data format. To ensure that dates are translated consistently, the following abbreviations shall be used for the three character month code:

Abbreviation Month

JAN	January
FEB	February
MAR	March
APR	April
MAY	May
JUN	June
JUL	July
AUG	August
SEP	September
OCT	October
NOV	November
DEC	December

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6.b.(3) The PROJECT IDENTIFIER is a maximum four character abbreviation for the schedule. These four characters shall be used to uniquely identify the project and specific update as agreed upon by Contractor and Contracting Officer. When utilizing scheduling software these four characters shall be used to select the project. Software manufacturers shall provide information to users to ensure that data importing programs do not automatically overwrite other schedules with the same PROJECT IDENTIFIER.

6.b.(4) The PROJECT NAME field shall contain the name and location of the project edited to fit the space provided. The data appearing here shall appear on scheduling software reports. The abbreviation "Alpha." refers to an "Alphanumeric" field value and shall be used throughout the remainder of this specification.

6.b.(5) The CONTRACTOR NAME field shall contain the Construction Contractor's name, edited to fit the space provided.

6.b.(6) The ARROW OR PRECEDENCE field shall indicate which method shall be used for calculation of the schedule. The value "A" shall signify the Arrow Diagramming Method. The value "P" shall signify the Precedence Diagramming Method. The ACTIVITY ID field of the Activity Record shall be interpreted differently depending on the value of this field. The Precedence Record shall be required if the value of this field is "P". [Usage note: software systems may not support both arrow and precedence diagramming. It is recommended that the selection of the type of network be based on the capabilities of the software used by project partners.]

6.b.(7) The CONTRACT NUMBER field shall contain the contract number for the project. For example, the construction contract number DACA85-89-C-0001 shall be entered into this field as "890001".

6.b.(8) The PROJECT START field shall contain the date that the Contractor acknowledges the Notice to Proceed (NTP). [Usage note: Software systems may use a project start date to constrain the first activity of a network. To ensure consistent scheduling calculations across products, it is recommended that the first activity in the schedule contain an EARLY START constraint and a software system's PROJECT START date only be used to report on the project's start date.]

6.b.(9) The PROJECT END field shall contain the date that the Contractor plans to complete the work as approved by the Contracting Officer. [Usage note: software systems may use a project end date to constrain the last activity of a network. To ensure consistent scheduling calculations across products, it is recommended that the last activity in the schedule contain an EARLY START constraint and a software system's PROJECT END date only be used to report on the project's end date.]

6.c. Calendar Record: The Calendar Record(s) shall follow the Project Identifier Record in the first disk of data transferred. A minimum of one Calendar Record shall be required for all data exchange activity files. The format for the Calendar Record shall be as follows:

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<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Req. Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1 - 4	4	CLDR	Fixed	Filled
CALENDAR CODE	6 - 6	1	√	Alpha.	Filled
WORKDAYS	8 - 14	7	SMTWTFS	Fixed	Filled
CALENDAR DESCRIPTION	16-45	30	√	Alpha.	Left Justified

6.c.(1) The RECORD IDENTIFIER shall always begin with "CLDR" to identify it as a Calendar Record. Each Calendar Record used shall have this identification in the first four columns.

[Usage note: Systems contain a variety of calendar options. It is recommended that the least common denominator of calendar features between the systems be used as the basis for creating the SDEF file for a given project.]

6.c.(2) The CALENDAR CODE shall be used in the activity records to signify that this calendar is associated with the activity. [Usage note: Some systems do not allow for alphanumeric CALENDAR CODES, but only allow positive integers from 1 to 9. It is recommended that only positive integers be used for the CALENDAR CODE field to support the widest variety of scheduling systems.]

6.c.(3) The WORKDAYS field shall contain the work-week pattern selected with "Y", for Yes, and "N", for No. The first character shall be Sunday and the last character Saturday. An example of a typical five (5) day work-week would be NYYYYYN. A seven (7) day work-week would be YYYYYYY.

6.c.(4) The CALENDAR DESCRIPTION shall be used to briefly describe the calendar used.

6.d. Holiday Record: The Holiday Record(s) shall follow the Calendar Record(s) in the first disk of data transferred. There may be calendars without any holidays designated or several Holiday Records for each Calendar Record(s). The format for the Holiday Record shall be as follows:

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<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Req. Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1 - 4	4	HOLI	Fixed	Filled
CALENDAR CODE	6 - 6	1	√	Alpha.	Filled
HOLIDAY DATE	8 - 14	7	√	ddmmmyy	Filled
HOLIDAY DATE	16-22	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	24-30	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	32-38	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	40-46	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	48-54	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	56-62	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	64-70	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	72-78	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	80-86	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	88-94	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	96-102	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	104-110	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	112-118	7	-	ddmmmyy	May be Filled
HOLIDAY DATE	120-126	7	-	ddmmmyy	May be Filled

6.d.(1) The RECORD IDENTIFIER shall always begin with "HOLI". Each Holiday Record used shall have this identification in the first four columns.

6.d.(2) The CALENDAR CODE indicates which work-week calendar the holidays shall be applied to. More than one HOLI record may be used for a given CALENDAR CODE.

6.d.(3) The HOLIDAY DATE shall contain the date of each individual non-work day.

6.e. Activity Records: Activity Records shall follow any Holiday Record(s). If there are no Holiday Record(s), then the Activity Records shall follow the Calendar Record(s). There shall be one Activity Record for every activity in the network. Each activity shall have one record in the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Req. Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1 - 4	4	ACTV	Fixed	Filled
ACTIVITY ID	6 - 15	10	√	Integer	See Comment Below
ACTIVITY DESCR.	17-46	30	√	Alpha.	Left Justified
ACTIVITY DURATION	48-50	3	√	Integer	Right Justified
CONSTRAINT DATE	52-58	7		ddmmmyy	May be Filled
CONSTRAINT TYPE	60-61	2		ES or LF	May be Filled
CALENDAR CODE	63-63	1	√	Alpha.	Filled
HAMMOCK CODE	65-65	1	Y, blank	Fixed	May be Filled
WORKERS PER DAY	67-69	3		Integer	Right Justified
RESPONSIBILITY CODE	71-74	4		Alpha.	Left Justified
WORK AREA CODE	76-79	4		Alpha.	Left Justified
MOD OR CLAIM NO.	81-86	6		Alpha.	Left Justified
BID ITEM	88-93	6		Alpha.	Left Justified
PHASE OF WORK	95-96	2		Alpha.	Left Justified
CATEGORY OF WORK	98-98	1		Alpha.	May be Filled
FEATURE OF WORK	100-128	30		Alpha.	Left Justified

6.e.(1) The RECORD IDENTIFIER for each activity description record must begin with the four character "ACTV" code. This field shall be used for both the Arrow Diagram Method (ADM) and Precedence Diagram Method (PDM),

6.e.(2) The ACTIVITY ID consists of coding that shall differ, depending on whether the ADM or PDM method was selected in the Project Record. If the ADM method was selected then the field shall be interpreted as two right-justified fields of five (5) integers each. If the PDM method was selected the field shall be interpreted as one (1) right-justified field of ten (10) integers each. The maximum activity number allowed under this arrangement is 99999 for ADM and 9999999999 for the PDM method. [Usage note: Many systems allow alphanumeric ACTIVITY IDs. While the SDEF does not strictly, allow the use of alphanumeric values, users may agree to use the ACTIVITY ID field to exchange alphanumeric data. It is recommended that the ACTIVITY ID be restricted to integers when one or more of the systems being used for scheduling allows only integer ACTIVITY ID values.]

6.e.(3) The ACTIVITY DESCRIPTION shall be a maximum of 30 characters. Descriptions must be limited to the space provided.

6.e.(4) The ACTIVITY DURATION contains the estimated original duration for the activity on the schedule. The duration shall be based upon the work-week designated by the activity's related calendar.

6.e.(5) The CONSTRAINT DATE field shall be used to identify a date that the scheduling system may use to modify float calculations. If there is a date in this field, then there must be a valid entry in the CONSTRAINT TYPE field.

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6.e.(6) The CONSTRAINT TYPE field shall be used to identify the way that the scheduling system shall use the CONSTRAINT DATE to modify schedule float calculations. If there is a value in this field, then there must be a valid entry in the CONSTRAINT DATE field. The valid values for the CONSTRAINT TYPE are as follows:

<u>Code</u>	<u>Definition</u>
ES	The CONSTRAINT DATE shall replace an activity's early start date, if the early start date is prior to the CONSTRAINT DATE.
LF	The CONSTRAINT DATE shall replace an activity's late finish date, if the late finish date is after the CONSTRAINT DATE.

[Usage note: Systems provide a wide variety of constraint types that may not be supported by other systems. It is recommended that constraint types be restricted to the values above regardless of the capabilities of the various systems being used for scheduling.]

6.e.(7) The CALENDAR CODE relates this activity to an appropriate work-week calendar. The ACTIVITY DURATION must be based on the valid work-week referenced by this CALENDAR CODE field.

6.e.(8) The HAMMOCK CODE indicates that a particular activity does not have its own independent duration, but takes its start dates from the start date of the preceding activity (or node) and takes its finish dates from the finish dates of its succeeding activity (or node). If the value of the HAMMOCK CODE field is "Y", then the activity is a hammock activity.

6.e.(9) The WORKERS PER DAY shall contain the average number of workers expected to work on the activity each day the activity is in progress. If this code is required by project scheduling specifications, values for this data will be right justified. Activities without workers per day shall have a value of "0".

6.e.(10) The RESPONSIBILITY CODE shall identify the subcontractors or major trade involved with completing the work for the activity. If this code is required by project scheduling specifications, value for this data will be left justified.

6.e.(11) The WORK AREA CODE shall identify the location of the activity within the project. If this code is required by project scheduling specifications, value for this data will be left justified.

6.e.(12) The MOD OR CLAIM NUMBER shall uniquely identify activities that are added or changed on a construction contract modification, or activities that justify any claimed time extensions. If this code is required by project scheduling specifications, value for this data will be left justified.

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6.e.(13) The BID ITEM shall identify the bid item number associated with each activity. If this code is required by project scheduling specifications, value for this data will be left justified.

6.e.(14) The PHASE OF WORK shall identify the timing of a specific activity within the entire project. If this code is required by project scheduling specifications, value for this data will be left justified.

6.e.(15) The CATEGORY OF WORK shall identify the general type of work performed by every activity. If this code is required by project scheduling specifications, value for this data will be placed in the field.

6.e.(16) The FEATURE OF WORK shall identify a very broad designation of the general type of work that is being accomplished by the activity. If this code is required by project scheduling specifications, value for this data will be left justified. [Usage note: Many systems require that FEATURE OF WORK values be placed in several activity code fields. It is recommended that users review SDEF documentation to determine the correct way to use a given software system to produce the FEATURE OF WORK code.]

6.f. Precedence Record: The Precedence Record(s) shall follow the Activity Records if a Precedence Diagram Method schedule (PDM) is identified in the ARROW OR PRECEDENCE field of the Project Record. The Precedence Record has the following format:

<u>Description</u>	<u>Column</u> <u>Max.</u>		<u>Req.</u>	<u>Type</u>	<u>Notes</u>
	<u>Position</u>	<u>Len.</u>	<u>Value</u>		
RECORD IDENTIFIER	1 - 4	4	PRED	Fixed	Filled
ACTIVITY ID	6-15	10	√	Integer	See Comment Below
PRECEDING ACTIVITY	17 - 26	10	√	Integer	See Comment Below
PREDECESSOR TYPE	28-28	1	√	S, F, C	Filled
LAG DURATION	30-33	4	√	Integer	Right Justified

6.f.(1) The RECORD IDENTIFIER shall begin with the four characters "PRED" in the first four columns of the record.

6.f.(2) The ACTIVITY ID identifies the activity whose predecessor shall be specified in this record.

6.f.(3) The PRECEDING ACTIVITY number is the number of an activity that precedes the activity noted in the ACTIVITY ID field.

6.f.(4) The PREDECESSOR TYPE field indicates the type of relation that exists between the chosen pair of activities. Valid PREDECESSOR TYPE fields areas follows:

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<u>Code</u>	<u>Definition</u>
S	Start-to-Start relation
F	Finish-to-Finish relation
C	Finish-to-Start relation

[Usage note: Some systems provide additional predecessor types that may not be supported by all other systems. It is recommended that predecessor types be restricted to the values above regardless of the capabilities of the various systems being used for scheduling.]

6.f.(5) The LAG DURATION field contains the number of days delay between the preceding and current activity. [Usage note: Some systems allow negative values for the LAG DURATION. Because these values are not supported by all other systems, it is recommended that values be restricted to zero and positive integers.]

6.g. Unit Cost Record: The Unit Cost Record shall follow all Precedence Records. If the schedule utilizes the Arrow Diagram Method, then the Unit Cost Record shall follow any Activity records. There shall be one Unit Cost Record for every activity that is not a lump sum activity. [Usage note: (1) It is recommended that users who wish to exchange unit cost data contact SDEF vendor representatives to determine the ability of the software system to import/export unit cost information. (2) If the software being used by each member of the project team supports unit cost data then users may wish to conduct a trial run of the SDEF data exchange with a two or three-activity network to ensure that unit cost data transfers as expected. If problems are found please consult vendor representatives for resolution prior to exchange of full project schedules. (3) Unit cost record data does not, in most systems, result in the correct values being placed in the ACTIVITY COST and COST TO DATE fields of the Progress (PROG) Record. Users must, at this time, manually transfer the data from the Unit Cost Record to the Progress Record.

The fields for this record shall take the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Req. Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1 - 4	4	UNIT	Fixed	Filled
ACTIVITY ID	6-15	10	√	Integer	See Comment Below
TOTAL QTY	17-29	13	√	Format 8.4	Right Justified
COST PER UNIT	31-43	13	√	Format 8.4	Right Justified
QTY TO DATE	45-57	13	√	Format 8.4	Right Justified
UNIT OF MEASURE	59-61	3	√	Alpha.	Left Justified

6.g.(1) The RECORD IDENTIFIER shall be identified with the four characters "UNIT" placed in the first four columns of the record.

6.g.(2) The ACTIVITY ID for each activity shall match the format described in the activity record. Each activity may have only one Unit Cost Record.

6.g.(3) The TOTAL QTY is the total amount of material to be used in this activity. This number consists of eight digits, one decimal point and four more digits. An example of a number in this format is "11111111.1111". If decimal places are not needed this field shall still contain a ".0000" in columns 25-29. [Usage note: Many systems support a different format for this value that does not include as many decimal places. It is recommended that users determine their requirements for significant digits based on the lowest common denominator of the software systems being used for a given project.]

6.g.(4) The COST PER UNIT is the cost, in dollars and cents, for each unit to be used in this activity. This number consists of eight digits, one decimal point, and four more digits. An example of a number in this format is "11111111.1111". If decimal places are not needed this field shall still contain a ".0000" in columns 39-43. [Usage note: Many systems support a different format for this value that does not include as many decimal places. It is recommended that users determine their requirements for significant digits based on the lowest common denominator of the software systems being used for a given project.]

6.g.(5) The QTY TO DATE is the quantity of material installed in this activity up to the data date. This number consists of eight digits, one decimal point, and four more digits. An example of a number in this format is "11111111.1111". If decimal places are not needed this field shall still contain a ".0000" in columns 53-57. [Usage note: Many systems support a different format for this value that does not include as many decimal places. It is recommended that users determine their requirements for significant digits based on the lowest common denominator of the software systems being used for a given project.]

6.g.(6) The UNIT OF MEASURE is an abbreviation that may be used to describe the units being measured for this activity. Valid values for this field are any meaningful English or metric unit, except "LS" for Lump Sum. Lump Sum activities are not to have Unit Cost Records.

6.h. Progress Record: Progress Record(s) shall follow all Unit Cost Record(s). If there are no Unit Cost Record(s), then the Progress Record(s) shall follow all Precedence Records. If the schedule utilizes the Arrow Diagram Method, then the Progress Record shall follow any Activity Records. One Progress Record is required for every activity in the Activity Record. The fields for this Record shall be provided in the following format:

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<u>Description</u>	<u>Column</u> <u>Position</u>	<u>Max.</u> <u>Len.</u>	<u>Req.</u> <u>Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1-4	4	PROG	Fixed	Filled
ACTIVITY ID	6-5	10	√	Integer	See Comment Below
ACTUAL START DATE	17-23	7	√	ddmmyy	Filled if Started
ACTUAL FINISH DATE	25-31	7	√	ddmmyy	Filled if Finished
REMAINING DURATION	33-35	3	√	Integer	Right Justified
ACTIVITY COST	37-48	12	√	Format 9.2	Right Justified
COST TO DATE	50-61	12	√	Format 9.2	Right Justified
STORED MATERIAL	63-74	12	√	Format 9.2	Right Justified
EARLY START DATE	76-82	7	√	ddmmyy	Filled if Not Started
EARLY FINISH DATE	84-90	7	√	ddmmyy	Filled if Not Finished
LATE START DATE	92-98	7	√	ddmmyy	Filled if Not Started
LATE FINISH DATE	100-1067		√	ddmmyy	Filled if Not Finished
FLOAT SIGN	108-1081		+, -	Fixed	Filled if Not Finished
TOTAL FLOAT	110-1123		√	Integer	R. Just. if Not Finished

6.h.(1) The RECORD IDENTIFIER shall begin with the four characters "PROG" in the first four columns of the record.

6.h.(2) The ACTIVITY ID for each activity for which progress has been posted shall match the format described in the Activity Record.

6.h.(3) An ACTUAL START DATE is required for all in-progress activities. The ACTUAL START DATE shall be the same as, or later than, the PROJECT START date contained in the Project Record. The ACTUAL START DATE shall also be the same as, or prior to, the DATA DATE contained in the Project Record. If there is an ACTUAL START DATE for an activity that there must also be a REMAINING DURATION, and the values for the EARLY START DATE and LATE START DATE are blank. [Usage note: Some systems allow default values for ACTUAL START DATE if the date is not entered by the user. Because the failure to include a start date for activities may result in different schedule calculations, it is recommended that the ACTUAL START DATE be required for all activities in progress.]

6.h.(4) An ACTUAL FINISH DATE is required for all completed activities. If the REMAINING DURATION of an activity is zero, then there must be an ACTUAL FINISH DATE. If there is an ACTUAL FINISH DATE, then values for the EARLY START DATE, LATE START DATE, EARLY FINISH DATE, LATE FINISH DATE, FLOAT SIGN, and TOTAL FLOAT shall be blank. [Usage note: Some systems allow default values for ACTUAL FINISH DATE if the date is not entered by the user. Because the failure to include a finish date for activities may result in different schedule calculations, it is recommended that the ACTUAL FINISH DATE be required for all activities in progress.]

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6.h.(5) AREMAINING DURATION is required for all activities. Activities that have not started shall have a remaining duration equal to their original duration. Activities completed based on time, shall have a zero (0) REMAINING DURATION. [Usage note: Systems have a variety of "short-cut" methods to determine the REMAINING DURATION value. It is recommended that users actually consider the time required to complete the remaining work on a given task, rather than allow a system to calculate the remaining duration based on the amount of work that has already been accomplished.]

6.h.(6) The ACTIVITY COST contains the estimated earned value of the work to be accomplished in the activity. An example of a number in this format is "1111111 11.11". If decimal places are not needed this field shall still contain a ".00" in the last three columns of this field. [Usage note: Users should inquire of software vendors if the user needs to add a zero in the data field to produce the default value "0.00".]

6.h.(7) The COST TO DATE contains the earned value for the activity. If there is an ACTUAL START DATE, then there must also be some value for COST TO DATE. An example of a number in this format is "11111111.11". If decimal places are not needed, this field shall still contain a ".00" in the last three columns of this field. The COST TO DATE is not tied to REMAINING DURATION. For example, if the REMAINING DURATION is "0", the COST TO DATE may only be 95% of the ACTIVITY COST. This difference may be used to reflect 5% retainage for punch list items. [Usage note: Systems implement cost information in different ways. It is recommended that users carefully review SDEF documentation and test results to determine how to ensure that SDEF data is exported correctly.]

6.h.(8) The STORED MATERIAL field contains the value of the material that the Contractor has paid for and is on site or in secure storage areas that is a portion of the COST TO DATE. An example of a number in this format is "11111111.11". If decimal places are not needed, this field shall still contain a ".00" in the last three columns of this field. [Usage note: Systems implement the stored materials field in a variety of ways. Many systems do not enforce STORED MATERIAL + COST TO DATE < ACTIVITY COST. To avoid potential confusion between systems, it is recommended that new activities be added to a schedule to reflect the cost of large equipment procurement rather than use the STORED MATERIALS field.]

6.h.(9) The EARLY START DATE indicates the earliest date possible that an activity can start as calculated by a CPM scheduling system or other Contracting Officer approved planning method. If the progress record for an activity contains an ACTUAL START DATE, then this field shall be blank.

6.h.(10) The EARLY FINISH DATE indicates the earliest date possible that an activity can finish as calculated by a CPM scheduling system or other Contracting Officer approved planning method. If the progress record for an activity contains an ACTUAL FINISH DATE, then this field shall be blank.

6.h.(11) The LATE START DATE indicates the latest date that an activity can begin as calculated by a CPM scheduling system or other Contracting Officer approved planning method. If the progress record for an activity contains an ACTUAL START DATE, then this field shall be blank.

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6.h.(12) The LATE FINISH DATE indicates the latest date that an activity can finish as calculated by a CPM scheduling system or other Contracting Officer approved planning method. If the progress record for an activity contains an ACTUAL FINISH DATE, then this field shall be blank.

6.h.(13) The FLOAT SIGN indicates whether the float time calculated using a CPM scheduling system or other Contracting Officer approved planning method, is positive or negative in nature. If the progress record for an activity contains an ACTUAL FINISH DATE, then this field shall be blank. In the case of zero float this field shall be blank.

6.h.(14) The TOTAL FLOAT indicates the total float time. In the Precedence Diagram Method (PDM), the total float is the difference between the early and late start or finish dates. In the Arrow Diagram Method (ADM), the total float is equal to the late event time at the end of the activity, minus the sum of the early event time at the start of the activity plus the duration of the activity.

6.i. Project End Record: The Project End Record shall be used to identify that the data file is completed. If the ASCII End of File character is encountered, then data import programs shall use that character to infer that the data continues on the next disk. The user shall then be prompted for the next disk number, based on the VOLM record data. The Project End Record shall be the last record of the entire data file, and shall have the following format:

<u>Description</u>	<u>Column</u>	<u>Max.</u>	<u>Req.</u>		
	<u>Position</u>	<u>Len.</u>	<u>Value</u>	<u>Type</u>	<u>Notes</u>
RECORD IDENTIFIER	1-3	3	END	Fixed	Filled

6.i.(1) The RECORD IDENTIFIER for the Project End Record shall be "END". Data contained in the data exchange file that occurs after this record shall not be used.

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers and titles as follows:

SD-01 PreConstruction Submittals

Project Schedule.
Submittal Register.
Safety Plan.
Construction Quality Control Plan.
Environmental Control Plan.
Waste Management Plan.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the contractor for integrating the product or system into the project.
Drawings prepared by or for the contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of materials or product and establish standards by which the work can be judged.
Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
Field samples and mock-ups constructed on the project site to establish standards by which the ensuing work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at the conclusion of the work.

SD-05 Design Data

Calculations, mix designs, analyses and other data pertaining to a part of the work.

SD-06 Test Reports

Report signed by an authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with the specified requirements. (Testing must have been within three years of date of contract award for the project, unless otherwise specified.)

Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to the job site.

Report which includes findings of a test made at the job site or on a sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Final testing and acceptance reports.

SD-07 Certificates

Statements signed by a responsible official of the company that manufactured a product, system or material attesting that product, system or material meets the specified requirements. Must be dated after award of the project contract, clearly name the project and identify the product, system or material being certified, including the specified required being met.

Documentation required of the Contractor, or of a supplier, installer or subcontractor through the contractor, the purpose of which is to verify the orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including, but not limited to, special notices, Material Safety Data Sheets (MSDS) concerning impedances, hazards and safety precautions.

SD-10 Operation and Maintenance Data

Data intended to be incorporated in operations and maintenance manuals.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

As-built drawings.

As-built record of equipment and materials.

Final Approved Shop Drawings.

Real Property Equipment List.

Warranty Management Plan.

Warranty Tags.

Mechanical Testing, Adjusting, Balancing, and Commissioning Report.

Operation and Maintenance Manuals.

Final Clean-up List.

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.2.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained and/or complete, satisfactory "FIO" submittals have not been received by the Government.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with this Section.

SD-01 PreConstruction Submittals

Submittal Register (ENG Form 4288)
Monthly updates (ENG form 4288)

Four copies of the completed ENG Form 4288.

Two copies of the monthly update as specified shall be submitted together with the monthly progress payment requests.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER

At the end of this section is one set of Submittal Forms listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor shall use the government-provided software, QCS (see Section 01312), to create the ENG Form 4288. The Contractor is responsible for completing the columns labeled: Activity Number, Transmittal Number, and Contract Schedule Dates on the submittal register form. The completed Submittal Register shall be submitted to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. The submit dates and need dates in the submittal register shall be coordinated with the dates in the Contractor's progress schedule. Updates to the Submittal Register showing the Contractor action codes and actual submittal dates with Government action codes and action dates shall be submitted monthly together with the monthly payment request, or until all submittals have been satisfactory completed. When the progress schedule is revised, the submittal register shall also be revised and both resubmitted for approval. The approval submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in incorrect, incomplete and/or late submittals. An

additional 15 calendar days shall be allowed and shown on the register for review and approval of submittals for food service equipment, fire sprinkler and fire alarm systems, and refrigeration and HVAC control systems.

3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.4.1 USE

A transmittal form (ENG Form 4025) shall be used for submitting both Government approved and information only submittals. The Contractor shall use the government provided software, QCS (see Section 01312), to create the Eng Form 4025. A separate transmittal form shall be used for each specification section. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number the contract drawings pertinent to the date submitted or each item.

3.4.2 NUMBERING

Transmittals shall be numbered. The transmittal number shall consist of 2 parts, the specification number and the sequence number, e.g. 01330-001. Each specification section shall begin with the sequence number, 001. Resubmittals shall be identified by a decimal number appended to the original transmittal number, e.g. 01330-001.1, shall identify resubmittals.

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

The Contractor shall establish procedures for purchasing materials and equipment, subcontracting, and processing of shop drawings, outlining the responsibilities at each level to insure that adequate review and approval, timely delivery, verification of procedures and proper storage are provided. Delays in the review and approval process shall not be given consideration for a time extension or additional cost, when such delays are the result of the Contractor's late submittal or failure to provide proper submittals; or make corrections in compliance with the contract documents or the Contracting Officer's comments; or provide a resubmittal because if an unacceptable original submittal.

Submittals to the Contracting Officer are required in the number of copies identified in paragraphs 3.7 and 3.8 and shall be submitted to:

U.S. Army Corps of Engineer District, Honolulu
Fort Shafter Resident Office
Bldg 230

Fort Shafter, Hawaii 96858-5440

3.5.2 Deviations

- a. For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.
- b. In cases where "trade names or equal" are used in the plans and/or Technical Specifications, any "equal" substitution by the Contractor is considered a variance and will require the Government's approval. Approval action by the Contracting Officer will not relieve the Contractor of his quality control responsibility and compliance with the contract, except for those specific portions of the submittal which clearly highlight the departures from the contract, and which are brought to the attention of the Government. The Contractor shall be responsible for all corrective actions, when submittals containing provisions of non-compliance with the contract are not specifically brought to the Government's attention. Any associated cost or time loss from such corrective actions shall not be made subject to a claim against the Government.
- c. Variations from the contract requirements may require an appropriate contract modification prior to acceptance by the Government; however, such pending action shall not be a basis of claim for time or additional cost against the Government, since the Contractor still has the option to comply with the original contract requirements. If the variation is of a minor nature and does not affect a change in cost or time of performance, a modification may not be issued. All variations shall meet the standards set by the contract documents.

3.6 COORDINATION OF LAYOUTS

The Contractor Quality Control (CQC) organization is responsible for insuring that the shop drawings and submittals of the different trades are coordinated in order that space conflicts during installation/construction of mechanical, electrical, architectural, civil, structural and other items of work are avoided. The Contractor shall be required to prepare/develop coordinated working layout drawings prior to commencement of any feature of work, at any contractor tier, unless otherwise directed by the Contracting Officer. These layout drawings shall be reviewed and certified by the CQC organization prior to the start of work in any area. The CQC shall insure that layout drawings indicate all necessary features of work, providing for a coordinated arrangement of the various installations, giving full consideration for access to installed equipment/systems and the future maintenance of these items. Interference between equipment and systems or construction materials which cannot be resolved between Contractor and subcontracting tiers shall be resolved by the Contracting Officer at no additional cost to the Government, if it is determined that adequate space was available and installations could have been accommodated within the designated construction area through properly coordinated layout drawings. One (1) CQC certified copy of all layout drawings shall be available for Government's review five (5) working days prior to scheduled commencement of the work. Submission shall be made upon Government's request.

3.7 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.7.1 Monthly Updates of Submittal Register

Monthly updates of the initially accepted Submittal Registers, ENG Form 4288, shall be submitted in duplicate at the time the monthly progress payment is requested and be current to within one (1) week of the date of submission. When a monthly payment is not being requested, the update shall be submitted on the 15th of each month or the workday closest to the 15th. If the Contractor fails to provide the Government acceptable initial submittal registers or monthly updates within the specified time frames, the Government may issue a stop work order and/or withhold a portion of pending progress payments due to non-performance. Any resulting cost or time loss to the Contractor due to such Government action shall not be subject to a claim for the time extensions, additional cost or for damages by the Contractor. Furnishing of the submittal registers by the Contractor and subsequent review/acceptance by the Government do not relieve the Contractor of the obligation to comply with all of the contract submittal requirements; for example, even if a required submittal was not originally listed on the initial register accepted by the Government, the Contractor will still be responsible for providing such submittal in accordance with the contract. The following shall be provided on the monthly updates to the initially accepted schedule:

- a. Activity No., Transmittal No., and entries under other columns, as appropriate.
- b. Distinguish those submittals which are VARIANCES, as appropriate.
- c. Furnish a separate LISTING of required SUBMITTALS, together with the Government's review comments, and appropriate Contractor's status report on pending resubmittal actions.
- d. Furnish a separate LISTING of SUBMITTALS provided by the Contractor to the Government; and another separate LISTING of SUBMITTALS returned by the Government to the Contractor, for the particular month the update is furnished.

3.8 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. 3 copies of the submittal will be retained by the Contracting Officer and 1 copy of the submittal will be returned to the Contractor.

3.9 INFORMATION ONLY SUBMITTALS

Submittals provided For Information Only (FIO) to the Government shall be submitted in three (3) copies, including resubmittals. Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications;

will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.10 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

<p>CONTRACTOR</p> <p>(Firm Name)</p> <p>_____ I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated in Contract No. (DACA83- - -), is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, and is approved for use.</p> <p>SIGNATURE: _____</p> <p>TITLE: _____</p> <p>DATE: _____</p>

-- End Of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION OR REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01320	SD-01 Preconstruction Submittals														
			Preliminary Project Schedule														
			Initial Project Schedule														
			Periodic Schedule Updates														
			SD-06 Test Reports														
			Narrative Report														
			Schedule Reports														
			SD-07 Certificates														
			Qualifications														
		01330	SD-01 Preconstruction Submittals														
			Submittal Register (ENG Form 4288)														
			Monthly updates (ENG form 4288)														
		01430	SD-06 Test Reports														
			Environmental Protection Plan		G												
			SD-07 Certificates														
			NPDES Permit		G												
		01451	SD-01 Preconstruction Submittals														
			Quality Control Plan		G												
		01525	SD-01 Preconstruction Submittals														
			Accident Prevention Plan (APP)	1.8	G												
			Activity Hazard Analysis (AHA)	1.9	G												
			SD-06 Test Reports														
			Reports	1.13													
			Accident Reports	1.13.1													
			Monthly Exposure Reports	1.13.3													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI						CONTRACTOR											
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		01525	Regulatory Citations and Violations	1.13.4													
		01780	SD-02 Shop Drawings														
			As-Built Drawings														
			SD-03 Product Data														
			As-Built Record of Equipment and Materials														
			Warranty Management Plan														
			Warranty Tags														
			Final Clean-Up														
		01900	SD-06 Test Reports														
			Inspection of Existing Conditions														
			Dust Control														
			Excavation/Trenching Clearance														
			Condition of Contractor's Operation or Storage Area														
			SD-07 Certificates														
			Products Containing Recovered Materials														
		02215	SD-04 Samples														
			Geotextile	2.1.1													
			SD-07 Certificates														
			Mill Certificate or Affidavit														
		02220	SD-03 Product Data														
			Work Plan														
			SD-11 Closeout Submittals														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI						CONTRACTOR											
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		02220	Receipts														
		02300a	SD-03 Product Data														
			Earthwork														
			SD-06 Test Reports														
			Testing	3.12													
			SD-07 Certificates														
			Testing	3.12													
		02316a	SD-06 Test Reports														
			Field Density Tests	3.4.3													
			Testing of Backfill Materials	3.4.2													
		02373	SD-03 Product Data														
			Manufacturing Quality Control														
			Manual Sampling and Testing														
			SD-07 Certificates														
			Geotextile	2.1.1													
		02450	SD-02 Shop Drawings														
			Shop drawings and														
			manufacturer's catalog data														
		02458a	SD-02 Shop Drawings														
			Installation	3.1	G												
			SD-03 Product Data														
			Predrilling and Installation														
			Equipment														
			Contractors Qualifications														
			SD-06 Test Reports														
			Field Test and Inspections														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI						CONTRACTOR											
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		02482	SD-01 Preconstruction Submittals														
			Plant and Equipment Schedule														
			Operation Plan and Performance Schedule														
			Sweeping Plan, Method and Schedule														
			Interference with Navigation														
			SD-06 Test Reports														
			Dredging Records														
		02510a	SD-03 Product Data														
			Installation	3.1													
			Waste Water Disposal Method														
			Satisfactory Installation														
			SD-07 Certificates														
			Installation	3.1													
		02722a	SD-03 Product Data														
			Plant, Equipment, and Tools	1.5													
			Waybills and Delivery Tickets														
			SD-06 Test Reports														
			Sampling and testing	1.4													
			Field Density Tests	1.4.2.4													
		02811a	SD-06 Test Reports														
			Field Tests	3.2													
			SD-07 Certificates														
			Sprinkler System	3.1													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION OR REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		02811a	SD-10 Operation and Maintenance Data														
			Sprinkler System	3.1													
		02921a	SD-03 Product Data														
			Equipment														
			Surface Erosion Control Material	2.7													
			Chemical Treatment Material	1.4.3													
			Delivery	1.4.1													
			Finished Grade and Topsoil	3.2.1													
			Quantity Check	3.5													
			Seed Establishment Period	3.9													
			Maintenance Record	3.9.3.5													
			Application of Pesticide	3.6													
			SD-04 Samples														
			Delivered Topsoil	1.4.1.1													
			Soil Amendments	2.3													
			SD-06 Test Reports														
			Soil Test	3.1.2													
			SD-07 Certificates														
			Seed	2.1													
			Topsoil	2.2													
			pH Adjuster	2.3.1													
			Fertilizer	2.3.2													
			Organic Material	2.3.4													
			Mulch	2.4													
			Pesticide	2.6													

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CONTRACT NO.

TITLE AND LOCATION
KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI

CONTRACTOR

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		02930a	SD-02 Shop Drawings														
			Finished Grade, Topsoil and Underground Utilities	3.2.1													
			SD-03 Product Data														
			Delivery	1.4.1													
			Plant Establishment Period	3.9													
			Maintenance Record	3.9.2.6													
			Application of Pesticide	3.7													
			SD-04 Samples														
			Delivered Topsoil	1.4.1.3													
			Soil Amendments	3.1.2.1													
			Mulch	2.4													
			SD-06 Test Reports														
			Soil Test	3.1.2.1													
			SD-07 Certificates														
			Plant Material	2.1													
			Topsoil	2.2													
			Fertilizer	2.3.1													
			Organic Material	2.3.2													
			Organic Mulch	2.4.1													
			Pesticide	2.9													
			SD-10 Operation and Maintenance														
			Data														
			Maintenance Instructions	3.9.5													
		02935a	SD-03 Product Data														
			Work Plan and Schedule														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI						CONTRACTOR											
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		02935a	Delivery Schedule	1.3.1													
			Maintenance Record	3.6.4													
			Application of Pesticide	3.5													
		03201	SD-02 Shop Drawings														
			Fabrication and Placement	3.1													
			SD-04 Samples														
			Epoxy-Coated Bars	2.1.1.1													
			SD-07 Certificates														
			Epoxy-Coated Steel Bars	2.1.1.1													
			Reinforcing Steel														
		03230	SD-02 Shop Drawings														
			Installation Drawings	3.1.2													
			SD-03 Product Data														
			Prestressing Method and Equipment	3.1.1													
			Materials Disposition Records	3.3													
			Prestressing Operations Records	3.1.6													
			SD-06 Test Reports														
			Stressing Tendons and Accessories	2.1													
			SD-07 Certificates														
			Certification of Prestressing Technicians	1.3													
		03311	SD-02 Shop Drawings														
			Reinforcing steel	1.6.2.1													
			Formwork	1.6.2.2													

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CONTRACT NO.

TITLE AND LOCATION

KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI

CONTRACTOR

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		03311	Construction joints	3.2.6													
			SD-03 Product Data														
			Materials for curing concrete	2.2.8													
			Joint sealants	2.2.11													
			Joint filler	2.2.10													
			Epoxy bonding compound	2.2.12													
			Epoxy coatings	3.2.5													
			Non-shrink grout	2.2.4													
			Sealer-hardener	2.2.9													
			Preformed joint filler														
			Reinforcement supports	3.2.2													
			SD-05 Design Data														
			Mixture design	1.6.1													
			SD-06 Test Reports														
			Concrete mixture proportions	1.6.4.1													
			Natural pozzolan														
			Ground iron blast-furnace slag														
			Silica fume	1.6.4.2													
			Aggregates	1.6.4.3													
			Admixtures	1.6.4.4													
			Cement	1.6.4.5													
			Water	1.6.4.6													
			Reinforcement and protective coating														
			SD-07 Certificates														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI

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		03311	Silica fume manufacturer's supplier representative	1.6.3.4													
			Quality assurance	1.6.3.5													
			Field testing technician and testing agency	1.6.3.6													
			Mixture designs	1.6.3.7													
		03350	SD-07 Certificates														
			Proportions of Mix														
			SD-06 Test Reports														
			Test Reports														
			SD-07 Certificates														
			Cementitious Materials														
		03410N	SD-02 Shop Drawings														
			Drawings of precast members	1.7.1													
			SD-03 Product Data														
			inserts	2.2.6.1													
			Bearing pads														
			SD-04 Samples														
			Surface finish	2.3.4													
			SD-05 Design Data														
			Concrete mix design	1.7.2													
			SD-06 Test Reports														
			Contractor-furnished mix design	2.1													
			SD-07 Certificates														
			Fabrication	2.3													
			SD-11 Closeout Submittals														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI						CONTRACTOR											
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		03410N	batch ticket	1.7.3													
		03415a	SD-02 Shop Drawings														
			Erection	3.10													
			SD-03 Product Data														
			Design Calculations	1.3.1.3													
			Concrete Mixture Proportions	2.2													
			Construction Records	3.11													
			SD-06 Test Reports														
			Materials	2.1													
			Concrete	1.3.2.2													
			SD-07 Certificates														
			Cement	2.1.1													
			Pozzolan	2.1.2													
			Air-Entraining Admixture	2.1.3.2													
			Water-Reducing Admixture	2.1.3.2													
			Aggregates	2.1.3.1													
			Silica Fume														
			Corrosion Inhibitor														
		04413	SD-02 Shop Drawings														
			Selection of borrow sources and detailed plans for quarry operations														
			SD-04 Samples														
			Stone														
		05055a	SD-02 Shop Drawings														
			Detail Drawings	1.3													
			SD-03 Product Data														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION						CONTRACTOR											
KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI																	
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		05055a	Welding of Structural Steel	2.2.2.1													
			Structural Steel Welding Repairs														
			Materials Orders	2.1.1													
			Materials List	2.1.2													
			Shipping Bill														
			SD-06 Test Reports														
			Tests, Inspections, and Verifications														
			SD-07 Certificates														
			Qualification of Welders and Welding Operators	1.4													
		05500a	SD-02 Shop Drawings														
			Miscellaneous Metal Items	1.6													
			SD-04 Samples														
			Miscellaneous Metal Items	1.6													
		16375A	SD-02 Shop Drawings														
			Electrical Distribution System	3.7.3													
			As-Built Drawings														
			SD-03 Product Data														
			Nameplates	2.2													
			Material and Equipment	2.1													
			General Installation Requirements	3.1													
			SD-06 Test Reports														
			Factory Tests														
			Field Testing	3.7													
			Operating Tests														

SUBMITTAL REGISTER												CONTRACT NO.					
TITLE AND LOCATION						CONTRACTOR											
KAHULUI LIGHT DRAFT IMPROVEMENTS PHASE II - HARBOR, MAUI																	
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		16375A	SD-07 Certificates														
			Material and Equipment	2.1													
		16403A	SD-02 Shop Drawings														
			Drawings														
			Shop Drawings	2.2.1													
			Panelboards	2.3													
			SD-03 Product Data														
			Equipment														
		16528A	SD-02 Shop Drawings														
			Lighting System	1.3.1													
			Detail Drawings														
			As-Built Drawings	3.10.3													
			SD-03 Product Data														
			Equipment and Materials														
			Spare Parts														
			SD-06 Test Reports														
			Operating Test	3.10.2													
			Ground Resistance	3.10.3													
			Measurements														
			SD-10 Operation and Maintenance														
			Data														
			Lighting System	1.3.1													

**TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES,
OR MANUFACTURER'S CERTIFICATE OF COMPLIANCE**
(Read instructions on the reverse side prior to initiating this form)

(Read instructions on the reverse side prior to initiating this form)

SECTION 1 - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS: (This section will be initiated by the Contractor)

TO: FROM:

CONTRACT NO.

CHECK ONE:

☐ THIS IS A NEW TRANSMITTAL

☐ THIS IS A RESUBMITTAL OF TRANSMITTAL

SPECIFICATION SEC. NO. (Cover only one section with each transmittal)	PROJECT TITLE AND LOCATION
---	----------------------------

PROJECT TITLE AND LOCATION

CHECK ONE: THIS TRANSMITTAL IS FOR
☐ FIO ☐ GOV'T. APPROVAL

[illegible]

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)

NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY

DATE _____

ENG FORM 4025-R, MAR 95

(ER 415-1-10)

EDITION OF SEP 93 IS OBSOLETE

SHEET ____ OF ____

(Proponent: CEMP-CE)

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No." This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.
4. Submittals requiring expeditious handling will be submitted on a separate form.
5. Separate transmittal form will be used for submittals under separate sections of the specifications.
6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications -- also, a written statement to that effect shall be included in the space provided for "Remarks."
7. Form is self-transmittal, letter of transmittal is not required.
8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i. to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

- | | |
|---|--|
| A -- Approved as submitted. | E -- Disapproved (See attached). |
| B -- Approved, except as noted on drawings. | F -- Receipt acknowledged. |
| C -- Approved, except as noted on drawings.
Refer to attached sheet resubmission required. | FX -- Receipt acknowledged, does not comply as noted with contract requirements. |
| D -- Will be returned by separate correspondence. | G -- Other (Specify) |

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of ENG Form 4025-R)

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SECTION 01420

SOURCES FOR REFERENCE PUBLICATIONS

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-- End of Section Table of Contents --

SECTION 01420

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

ACI INTERNATIONAL (ACI)
P.O. Box 9094
Farmington Hills, MI 48333-9094
Ph: 248-848-3700
Fax: 248-848-3701
Internet: <http://www.aci-int.org>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)
444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 800-231-3475 202-624-5800
Fax: 800-525-5562 202-624-5806
Internet: <http://www.aashto.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
Internet: <http://www.ansi.org/>

Note --- Documents beginning with the letter "S" can be ordered from:

Acoustical Society of America
Standards and Publications Fulfillment Center
P. O. Box 1020
Sewickley, PA 15143-9998

Ph: 412-741-1979
Fax: 412-741-0609
Internet: <http://asa.aip.org>
General e-mail: asa@aip.org
Publications e-mail: asapubs@abdintl.com

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)
1250 I St., NW, Suite 500
Washington, DC 20005-3922
Ph: 202-789-2900
FAX: 202-789-1893
Internet: <http://www.anla.org>

AMERICAN WATER WORKS ASSOCIATION(AWWA)
6666 West Quincy
Denver, CO 80235
Ph: 800-926-7337 - 303-794-7711
Fax: 303-794-7310
Internet: <http://www.awwa.org>

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
Internet: <http://www.amweld.org>

ASME INTERNATIONAL (ASME)
Three Park Avenue
New York, NY 10016-5990
Ph: 212-591-7722
Fax: 212-591-7674
Internet: <http://www.asme.org>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)
University of South California
Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032
Fax: 213-740-8399
Internet: <http://www.usc.edu/dept/fccchr>

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)
120 Wall St., 17th Floor
New York, NY 10005-4001
Ph: 212-248-5000
Fax: 212-248-5017
Internet: <http://www.iesna.org>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Ln, P. O. Box 1331
Piscataway, NJ 08855-1331
Ph: 732-981-0060 OR 800-701-4333
Fax: 732-981-9667
Internet: <http://www.ieee.org>
E-mail: customer.services@ieee.org

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

127 Park St., NE
Vienna, VA 22180-4602
Ph: 703-281-6613
Fax: 703-281-6671
Internet: <http://www.mss-hq.com>
e-mail: info@mss-hq.com

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1300 N. 17th St., Suite 1847
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 703-841-3300
Internet: <http://www.nema.org/>
E-mail: jas_peak@nema.org

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
Ph: 617-770-3000
Fax: 617-770-0700
Internet: <http://www.nfpa.org>

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

209 West Jackson Blvd.
Chicago, IL 60606-6938
Ph: 312-786-0300
Fax: 312-786-0353
Internet: <http://www.pci.org>
e-mail: info@pci.org

UNDERWRITERS LABORATORIES (UL)

333 Pfingsten Rd.
Northbrook, IL 60062-2096
Ph: 847-272-8800
Fax: 847-272-8129
Internet: <http://www.ul.com/>
e-mail: northbrook@us.ul.com

U.S. ARMY CORPS OF ENGINEERS (USACE)

Order CRD-C DOCUMENTS from:

U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section, Services
Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Ph: 601-634-2664
Fax: 601-634-2388
Internet: <http://www.wes.army.mil/SL/MTC/handbook/handbook.htm>

Order Other Documents from:

USACE Publications Depot
Attn: CEIM-SP-D
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081

Fax: 301-394-0084
Internet: <http://www.usace.army.mil/publications>
or <http://www.hnd.usace.army.mil/techinfo/index.htm>

U.S. DEPARTMENT OF AGRICULTURE (USDA)

Order AMS Publications from:
AGRICULTURAL MARKETING SERVICE (AMS)
Seed Regulatory and Testing Branch
USDA, AMS, LS Div.
Room 209, Bldg. 306, BARC-East
Beltsville, MD 20705-2325
Ph: 301-504-9430
Fax: 301-504-8098
Internet: <http://www.ams.usda.gov/lsg/seed.htm>
e-mail: jeri.irwin@usda.gov

Order Other Publications from:
U.S. Department of Agriculture
14th and Independence Ave., SW, Room 4028-S
Washington, DC 20250
Ph: 202-720-2791
Fax: 202-720-2166
Internet: <http://www.usda.gov>

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

General Services Administration
1800 F Street, NW
Washington, DC 20405
PH: 202-501-0705

Order from:
General Services Administration
Federal Supply Service Bureau
1941 Jefferson Davis Highway
Arlington, VA 22202
PH: 703-605-5400
Internet: <http://www.fss.gsa.gov/pub/fed-specs.cfm>

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
700 Pennsylvania Avenue, N.W.
Washington, D.C. 20408
Phone: 866-325-7208
Internet: <http://www.archives.gov>

Order documents from:
Superintendent of Documents
U.S. Government Printing Office
732 North Capitol Street, NW
Washington, DC 20401
Mailstop: SDE
Ph: 866-512-1800 or 202-512-1800
Fax: 202-512-2250
Internet: <http://www.gpo.gov>
E-mail: gpoaccess@gpo.gov

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SECTION 01430

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

HAR

HAR Chapter 11-55, Appendix C	NPDES General Permit Coverage Guidelines for CWB-NOI Form C
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STATE OF HAWAII DEPARTMENT OF HEALTH (HIDOH)

HIDOH, Chapter 11-54	Administrative Rules, Water Quality Standards
HIDOH, Chapter 11-55	Administrative Rules, Water Pollution Control
HIDOH, Chapter 43	Administrative Rules, Title 11, Community Noise Control for Oahu
HIDOH, Chapter 59	Administrative Rules, Ambient Air Quality Standards
HIDOH, Chapter 60	Administrative Rules, Air Pollution Control

1.2 GENERAL REQUIREMENTS

This section covers prevention of environmental pollution and damage as the result of construction operations under this contract and for those measures set forth in the TECHNICAL REQUIREMENTS. For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

1.2.1 Subcontractors

Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

1.2.2 Notification

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the aforementioned Federal, State or local laws or regulations, permits, and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Environmental Protection Plan; G.

Within 30 calendar days of receipt of Notice to Proceed, the Contractor shall submit in writing an environmental protection plan. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures. The environmental protection plan shall include but not be limited to the following:

- a. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
- b. Methods for protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection; i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archeological, and cultural resources.
- c. Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures set out in accordance with the environmental protection plan.
- d. Location of the solid waste disposal area.
- e. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings,

material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

f. Environmental monitoring plans for the job site, including land, water, air, and noise monitoring.

g. Traffic control plan.

h. Methods of protecting marine, surface and ground water during construction activities, including Best Management Practices.

i. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.

j. Plan of borrow area(s).

k. Training for his personnel during the construction period.

SD-07 Certificates

NPDES Permit; G.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications.

3.1.1 Land Resources

Prior to the beginning of any construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

3.1.1.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas that are not required to accomplish all work to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects.

3.1.1.2 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas developed as approved by the Contracting Officer.

3.1.1.3 Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

- a. Retardation and Control of Runoff: Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and any measures required by areawide plans approved under Paragraph 208 of the Clean Water Act.
- b. Erosion and Sedimentation Control Devices: The Contractor shall construct or install all temporary and permanent erosion and sedimentation control features on the Best Management Practices (BMP) Plan as indicated in HAR Chapter 11-55, Appendix C to prevent surface runoff and sediments from entering harbor waters. Temporary erosion and sediment control measures such as berms, dikes, drains, grassing, and mulching shall be maintained until the end of construction.

3.1.1.4 Contractor Facilities and Work Areas

- a. Location of Field Offices, Storage, and Other Contractor Facilities: The Contractors' field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.
- b. Stockpile Areas on Government Property: Stockpile areas shall be managed and controlled to limit dredged material to areas designated on the drawings and prevent erosion of soil or sediment from entering nearby waters.
- c. Temporary Excavations and Embankments: Temporary excavations and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

3.1.2 Disposal of Wastes

Disposal of wastes shall be as specified in Section 02220 DEMOLITION and as specified hereinafter.

3.1.2.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers

which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed such that no hazardous or toxic waste will become commingled with solid waste. The Contractor shall transport all solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The Contractor shall comply with site procedures and with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.1.2.2 Chemical Wastes:

Chemical wastes shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and local laws and regulations.

3.1.2.3 Hazardous Wastes:

The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing and shall collect waste in suitable containers observing compatibility. The Contractor shall transport all hazardous waste off Government property and dispose of it in compliance with Federal and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer. Cleanup and cleanup costs due to spills shall be the responsibility of the Contractor.

3.1.3 Historical, Archeological, and Cultural Resources

Existing historical, archeological, and cultural resources within the Contractor's work area will be so designated by the Contracting Officer if any has been identified. The Contractor shall take precautions to preserve all such resources as they existed at the time they were pointed out to him. The Contractor shall provide and install all protection for these resources so designated and shall be responsible for their preservation during this contract. If during excavation or other construction activities in areas with existing or known resources, as well as in any other work area, any unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. These resources or cultural remains (prehistoric or historic surface or subsurface) include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, paving, wall, or other constructed features; and any indication of agricultural or other uses. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer. When so notified, the Contracting Officer will initiate action so that prompt and proper data recovery can be accomplished. In the mean time, recording and preservation of historical and archeological finds during construction activities shall be reported in accordance with the SPECIAL CONTRACT REQUIREMENTS.

3.1.4 Water Resources

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. All activities, equipment processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the HDOH, Chapter 11-54 and HDOH, Chapter 11-55. Special management techniques as set out below shall be implemented to control water pollution by the construction activities included in this contract.

3.1.4.1 Washing and Curing Water

Waste waters directly derived from dewatering dredged material and other construction activities shall not be allowed to enter water areas. These waste waters shall be collected and placed in retention pond where suspended material can be settled out or the water evaporates so that pollutants are separated from the water.

3.1.4.2 Construction BMPs Plan (CBMP)

The Contractor shall be responsible for compliance with the "General Best Management Practices Plan", dated July 4, 2004 that has been prepared for this project (Attachment 1). In addition, the Contractor shall prepare and submit a Construction BMPs Plan (CBMP) in accordance with NGPC (Attachment 6), paragraph 6.d. In-water construction activity will not be permitted until all comments on the CBMP have been satisfactorily addressed. The CBMP shall be prepared in accordance with the attached "Guidelines for Construction Best Management Practices (BMPs) Plan" (Attachment 2).

3.1.4.3 Monitoring of Water Areas

Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. All water areas affected by construction activities shall be monitored by the Contractor. The Contractor's environmental protection plan shall describe his scheme for minimizing construction-related turbidity in near-shore waters. Construction-related turbidity at the project sites shall be controlled so as to meet Hawaii State Water Quality Standards (WQS) for the type and class of waters in which the project is located.

Effective silt containment devices shall be deployed to isolate the construction activity, to minimize the transport of potential pollutants, and to avoid the potential degradation of receiving water quality and the marine ecosystem. Periodic monitoring in accordance with the attached Scope of Work (Attachment 3) shall be conducted immediately outside the silt containment devices and at control stations to verify that WQS are not being exceeded due to project construction.

In-water construction shall be curtailed during sea conditions which are sufficiently adverse to render the silt containment devices ineffective. If monitoring indicates that the turbidity standard is being exceeded due to construction activities, the Contractor shall suspend the operation or operations causing excessive turbidity levels until the condition are corrected. Such suspension shall not form the basis for a claim against the Government.

3.1.4.4 Permits and Responsibilities

The following documents contained in this section are made a part of this contract. The Contractor shall comply with all permit requirements applicable to the project construction activities. The documents are annotated as follows: Responsibilities of the Contracting Officer are designated as "CO", responsibilities of the construction contractor are designated as "CC", joint responsibilities are designated as "CO/CC", and requirements not a part of this contract are designated as "NIC".

- a. Department of the Army Permit 200000171 (Attachment 4); Kahului Light Draft Navigation Improvement, Maui, Hawaii, Environmental

Assessment and Finding of No Significant Impact, dated October 23, 1996, Section 5.7 (Attachment 4a)

b. Section 401 Water Quality Certification (WQC) for the Kahului Harbor Light-Draft Navigation Improvements Project, Kahului, Maui, Hawaii, WQC 0000346/Army Authorization No. CW 95-0004 & Army File No. 200000171, dated January 26, 2001 (Attachment 5); Letter from State of Hawaii Department of Health, Subject: Section 401 Water Quality Certification (WQC), Kahului Harbor Light-Draft Navigation Improvements Project, Kahului, Maui, Hawaii, WQC 0000346/Army Authorization No. CW 95-0004 & Army File No. 200000171, dated January 21, 2003 (Attachment 5a)

c. Notice of General Permit Coverage (NGPC), National Pollutant Discharge Elimination System (NPDES), Kahului Light Draft Navigational Improvements, Ph. II - Harbor Improvements, Kahului Beach Road, Kahului, Maui, Hawaii, File No. HI R10B726, dated January 14, 2004 (Attachment 6); CWB-NOI Form C, dated January 5, 2004 (Attachment 6a); Solid Waste Disclosure Form for Construction Sites (Attachment 6b)

d. Conservation District Use Application (CDUA) MA-2988 for Light Draft Navigation Improvements, Kahului, Maui, dated October 17, 2000 (Attachment 7)

e. Kahului Light Draft Navigation Improvements, Job H.C. 4171, Special Management Area Use Permit and Shoreline Setback Variance, TMK: 3-7-01:21, 23, Kahului, Maui, Hawaii (SM1 970007, SSV970003), dated March 6, 2001 (Attachment 8)

The Contractor shall comply with all permit requirements applicable to the project's construction activities as stipulated in the documents listed above. Although the term "permittee" references the U.S. Army Corps of Engineers in the NGPC, for project purpose under this contract for the construction of the Kahului Light Draft Navigational Improvements, Ph. II - Harbor Improvements, the term "permittee" shall mean the Contractor.

The Contractor is advised that SMA Use Permit Condition 1 has been met. The State of Hawaii initiated and completed a project under this permit. Therefore, Condition 2 is in effect.

3.1.4.5 Other Related Documents

The Environmental Assessment (EA), Finding of No Significant Impact (FONSI), and other related documents prepared for this project are available for review at the offices of the Contracting Officer, Bldg. 200, Fort Shafter, Hawaii. Electronic copies are also available on the contracting website for this solicitation. A complete list of available documents is provided in Section 00900. The Contractor is advised to review the contents of these documents for information that may be useful in its prosecution of the work.

3.1.5 Fish and Wildlife Resources

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. Species that require specific attention which include, but are not limited to humpback whales and green sea turtles, along with measures for their protection will be listed by the Contractor prior to beginning of construction operations and be included in the

Contractor's environmental protection plan.

3.1.6 Air Resources

The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All equipment operated by and activities, processes, and work performed by the Contractor in accomplishing the specified construction shall be in strict accordance with HDOH, Chapter 59, HDOH, Chapter 60, and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained for those construction operations and activities specified in this section. Special management techniques as set out below shall be implemented to control air pollution by the construction activities which are included in the contract. The Contractor must obtain State of Hawaii Air Permits, if necessary.

3.1.6.1 Particulates

- a. Dust particles, aerosols, and gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress.
- b. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in paragraph Air Resources, herein before, to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. The Contractor must have sufficient competent equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

3.1.6.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

3.1.6.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

3.1.6.4 Monitoring of Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be monitored by the Contractor. Monitoring results will be periodically reviewed by the Government to ensure compliance.

3.1.7 Sound Intrusions

The Contractor shall keep construction activities under surveillance, and control to minimize damage to the environment by noise. The Contractor shall comply with the provisions of HDOH, Chapter 43.

3.2 POST CONSTRUCTION CLEANUP

The Contractor shall clean up area(s) used for construction.

3.3 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the plan submitted for approval by the Contracting Officer. This work will be accomplished at the Contractor's expense.

3.4 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.5 TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers, and instruments required for monitoring purposes) to ensure adequate and continuous environmental pollution control.

-- End of Section --

GENERAL BEST MANAGEMENT PRACTICES PLAN

April 10, 2000

Revised July 4, 2004

1. Control of Discharge Activities

a. During construction of the project the contractor will be required to adhere to applicable Federal, State of Hawaii, and County of Maui laws and regulations; this is a standard requirement in Corps construction contract specifications.

b. The contractor will be required to comply with the Environmental Protection portion (Section 01430) of the project plans and specifications. Section 01430, requires the contractor to develop an Environmental Protection Plan, which will detail the mitigative measures to be used based on the construction methods to be used, to comply with applicable regulations and insure that secondary environmental effects of construction operations are minimized. The contractor's plan must be approved by the Corp's Contracting officer, who is responsible for assuring that the contractor's operations do not violate applicable laws and regulations, including State of Hawaii Water Quality Standards.

c. Placement and pumping of uncured concrete products below the water level will be monitored carefully so spillage outside of the forms, bags, or confined spaces is kept to a minimum.

2. Mitigative Measures

The contract specifications and the contractor's required environmental protection plan shall incorporate the following mitigative measures:

a. In order to prevent excessive silt transport into areas of significant living corals and other reef resources, construction-related turbidity will be confined to the immediate vicinity of construction through the use of effective silt containment devices. In the event that a turbidity plume is observed outside the containment area, the silt containment device shall be checked for proper functioning, and if necessary, repaired or repositioned so that the spread of the plume is contained to the extent practicable. If water quality

monitoring (see section 3 below) indicates that the turbidity standard is being exceeded in receiving waters due to construction activities, the Contractor shall suspend the operation or operations causing the excessive turbidity levels until the condition is corrected.

b. In-water construction will be curtailed during sea conditions which are sufficiently adverse to render the silt containment devices ineffective as determined by the Contracting Officers Representative.

c. All storage of construction-related materials will be above the influences of the tides.

d. Exposed surfaces will be protected from erosion with armor stone as soon after excavation as practicable.

e. All construction-related materials will be free of pollutants.

f. Wastes will not be permitted to fall, flow, leach, or otherwise enter the ocean.

g. All dredged material will be stockpiled on land above the influence of the tides. No runoff will be allowed to re-enter the ocean. In addition, the stockpiles will be attenuated to facilitate exposure of algae and other biogenic materials to the sun and air to allow rapid drying, thus minimizing anaerobic decomposition and the unpleasant odoriferous byproducts associated with it.

h. Blasting will not be permitted.

3. Monitoring Program

Adequate water quality monitoring will be conducted to detect effects of the construction activity and to evaluate the adequacy of the pollution control measures. Monitoring will be conducted prior to construction, during construction, and following completion of construction. Details of the monitoring program are described in the attached Scope of Work.

Guidelines for Construction Best Management Practices (BMPs) Plan
The BMPs Plan, at a minimum, shall include:

1. Site Characterization

The Site Characterization shall identify the ambient condition at the project site. The Site Characterization, at a minimum, shall include:

- a. Location(s) of construction site (e.g., ocean, perennial stream, intermittent stream, wetlands, estuary, reservoir, etc):
 - (1) If the project site(s) is located in the wetlands or in the immediate vicinity of the wetlands, submit wetlands delineation and identify whether there will be any losses to the wetlands, in either function or acreage or both;
 - (2) If any loss(es) to wetlands is identified, an acceptable mitigation and/or compensation Plan shall be submitted;
- b. Description of any specific attention or protection needed to protect the ecosystem at the project site;
- c. Description of type, composition, and quantity of the material to be excavated/dredged;
- d. Description of type, composition, and quantity of the material to be placed in State waters; and
- e. Description of the dredged/excavated material (wet or dry). If dewatering of the dredged/excavated material is needed and discharge of dewatering effluent is anticipated:
 - (1) An acceptable dewatering treatment and discharging plan shall be prepared and submitted; and
 - (2) Identification of the location(s) for dredged/excavated material stockpile site, dewatering treatment site and dewatering discharge point on a 8-1/2" x 11" map.

2. Construction Sequence

The construction sequence constitutes an important portion of the water pollution control plan. The construction

sequence shall be arranged to minimize the potential adverse impact(s) resulting from the proposed construction activities. The construction schedule shall be clearly identified, particularly, the schedule of the in-stream and/or in-water work. Selection of the dry season, low, or no-stream-flow period to conduct the in-stream construction activities is preferred. A contingency plan is needed to ensure that, even under the worst case scenario, the construction activity will have minimal adverse impact(s) to the State waters.

3. Construction Method(s)

The BMPs Plan shall also identify the specific construction method(s) to be applied with respect to each type of construction activity proposed. The BMPs Plan shall also describe the type of equipment involved and how and where this type of equipment would be employed.

4. Characteristics of the Discharge and Potential Pollutants Associated with the Proposed Construction Activity

The potential discharge, at a minimum, shall include the following:

- a. Materials placed or to be placed, both temporarily or permanently, into State waters:
- b. Materials that may enter State waters due to the proposed construction activities such as soil erosion, discharges from the trenching activity, bedding materials, construction debris, removed vegetation and soil attached to the roots, construction dewatering effluent discharges, hydrotesting effluent discharges, storm water discharges associated with the construction activities, runoff from excessive construction site dust control process, runoff from stockpiling site, concrete truck washdowns, etc.;
- c. Materials that may re-enter State waters such as runoff or return flow from the dredged/excavated material dewatering site or runoff from the dredged/excavated material stockpiling site(s);
- d. Discharges associated with the operation and maintenance of the equipment involved, such as oil leak(s) from the equipment, spills from the equipment fueling operation, spills from the fuel storage

- e. Temporary structure(s) construction, removal and restoration related discharges such as from the construction and removal of berm(s), dike(s), cofferdam(s), sheet piling(s), sandbag(s), silt curtain(s) etc.

5. Proposed Control Measures or Treatment

The selection of the most appropriate and effective control measure(s) shall be based on the information obtained in 1, 2, 3, and 4. Control measures need to be designed, implemented, and maintained in a manner to properly isolate and confine the construction activity(ies) and to contain and prevent the potential pollutant(s) discharges from adversely impacting the State water quality. In some cases, treatment is required before the discharges can be permitted to enter or re-enter the State waters. Location(s) of the structural control measure(s), stockpiling site(s), treatment facility(ies) (including dewatering facility), return flow discharge site(s), dredged/excavated material stockpiling site(s), dredged/excavated material disposal site(s), etc. need to be clearly identified on a 8-1/2" X 11" map. Typical sections of the structural control measure(s) shall also be submitted as part of the BMPs Plan.

SCOPE OF WORK

MARINE WATER QUALITY MONITORING SERVICES FOR KAHULUI LIGHT-DRAFT NAVIGATION IMPROVEMENTS ISLAND OF MAUI, HAWAII

29 October 1998

Revised 20 July 2000

Revised 12 March 2003

Revised 4 July 2004

1. LOCATION

The Contractor will make repeated collections of marine water samples at designated locations and depths within Kahului Deep-Draft Harbor, Maui, Hawaii, and transport the samples to the Contractor's laboratory as necessary to complete specified analyses.

2. GENERAL SCOPE OF WORK/WORK OBJECTIVES.

The purpose of the work is to conduct marine water sampling and analyses for four specified sampling stations in the vicinity of a planned Kahului Light-Draft Navigation Improvements, Kahului, Maui, Hawaii. The water sampling and testing will be performed by the Contractor to monitor specific water quality parameters before, during and after construction. The number of samples to be collected, frequency of collection, and the specific analyses to be performed shall be in accordance with the attached matrix from the State of Hawaii Department of Health (DOH), "General Monitoring Guideline for Section 401 Water Quality Certification Projects" (Matrix). The water quality sampling and testing results and the contractor's evaluation of compliance with State water quality standards for each sampling day during construction shall be transmitted in the form of a brief written laboratory report to the Authorized Representative of the Contracting Officer as soon as they become available so that they can be used by the Government to monitor the construction project. All field data and laboratory analyses shall be fully described and analyzed in a final summary report to the Government which can be used to document compliance or non-compliance with the State of Hawaii water quality standards (Reference b).

3. MAJOR WORK TASKS.

- a. Coordinate with the Authorized Representative of the Contracting Officer.
- b. Establish appropriate quality control and quality assurance procedures.
- c. Collect samples and associated field data.
- d. Analyze samples for specified parameters.
- e. Prepare and submit reports.

4. SPECIFIC WORK TASK DETAILS.

- a. Coordinate with the Authorized Representative of the Contracting Officer. The contractor shall coordinate with the Authorized Representative of the Contracting Officer to gather project

information, provide scheduling, points of contact, resolve contract difficulties, attend conferences and provide project status, and to assure timely and appropriate scheduling and completion of each of the sampling phases (pre-construction, during-construction, and post-construction).

b. Establish Appropriate Quality Control and Quality Assurance Procedures. The Contractor shall establish appropriate quality control (QC) and quality assurance (QA) procedures for this work. The QA/QC procedures shall cover the sample collection, sample transport, lab analysis and reporting of data. As a minimum, for each sampling day one trip blank (deionized water) and one duplicate station sample (blind laboratory sample) shall be subjected to the same handling and laboratory analysis as regular samples (described in section 4.c., below). The QA/QC procedures shall be described in a QA/QC Plan which shall be submitted in writing to the ARCO for approval prior to the initiation of sampling.

c. Collect Samples and Associated Field Data. A set of water samples shall be collected by the Contractor at the frequency specified in accordance with the matrix, with the proposed sampling dates subject to the approval of the Authorized Representative of the Contracting Officer. The post-construction sampling shall commence not sooner than 15 days following the last day of construction (as confirmed through coordination with the Authorized Representative of the Contracting Officer), and shall be conducted in accordance with the matrix. The water samples shall be collected at mid-water depth for a total of 4 samples per set. It is intended that two sampling stations be located approximately 1 meter from and on opposite ends outside of the silt containment devices surrounding the construction operation. The two remaining stations shall be located approximately 100 meters from the entrance channel alignment; one on the north side and one on the south side, to serve as reference stations (as shown in figure 1). The location of each sampling station shall be determined, recorded and mapped to an accuracy of 0.5 seconds of latitude and longitude. The collection of samples at each station shall be performed consistently with respect to depth from surface and stage of the tide, so that individual samples and sample sets represent replicates suitable for statistical analysis. Weather conditions, wave action, wind direction, tidal condition, and activities observed at each station during collection of the water samples shall also be recorded. Sample containers, preservation, and maximum holding times shall be as specified for turbidity in Table II of 40 CFR Part 136 (Reference c).

d. Analyze Samples for Specified Parameters.

(1) The Contractor shall analyze all field samples and QA/QC samples as appropriate for the following:

- turbidity (NTU)
- chlorophyll A
- total suspended solids
- salinity
- pH
- dissolved oxygen
- temperature
- total Kjeldahl nitrogen
- ortho-phosphate

Analyses shall be according to the method(s) specified in Federal regulations at 40 CFR Part 136 (Reference c) or, where this is lacking in information, then according to the method(s) of Reference a. Analysis shall include any necessary calibration of instruments, analysis of laboratory blanks, quality control samples or other mandates of the specified methods. The Contractor may substitute other methods only with the prior approval of the Authorized Representative of the Contracting Officer.

(2) All samples must be analyzed within the relevant maximum holding times stated in Table II of 40 CFR Part 136. The Government will not accept data generated after the maximum holding times have expired unless agreed upon in advance and with the approval of the Authorized Representative of the Contracting Officer.

e. Prepare and Submit Reports. The Contractor shall provide preliminary laboratory reports (when requested by the Government), written laboratory reports, and a final written summary report.

(1) Preliminary laboratory reports may be requested by the Government. These shall be furnished at no additional charge to the Government and may be given verbally (via telephone) or by facsimile (FAX) transmission. Preliminary reports are acknowledged to be tentative, subject to confirmation or change.

(2) A brief (approximately 1-2 pages) written laboratory report shall be prepared for each sample day. Each of these reports shall list the project name; the date of sample collection; the date of laboratory analysis; the name of the laboratory performing the analysis; the initials of the analyst; a brief statement concerning the observed degree of compliance or noncompliance with state water quality standards (Reference b) as indicated by the laboratory results and associated field data (and the apparent reason(s), if known, for any observed violations); the date of the report; and the signature of the PI. In reaching conclusions concerning degree of compliance with the state water quality standards and cause(s) of apparent violations, the Contractor shall conduct and consider the results of appropriate quantitative comparisons between the current field data obtained from project site monitoring stations and from control stations, and between the current data and baseline data (if any) previously provided by the Government. The method(s) to be used in conducting such comparisons shall include generally accepted statistical methods or other methods selected by the PI to be those which in his/her professional judgment are most appropriate for the purpose of ascertaining degree of compliance with the water quality standards. The method(s) used and results considered shall be described. The laboratory results for each sample shall be tabulated and shall include project name, sample number, station number, subsurface depth of sample, time of collection, analyze amounts and units of measure, and any relevant associated data or observations (see paragraph 4.c). Reports which include during-construction sampling results shall be sent to the Government within 24 hours of completion of laboratory analysis.

(3) A written final summary report shall be prepared which fully describes the results of analysis and supplemental information. This summary report shall, at the least, contain the following information:

(a) An introduction, which includes a statement of purpose and objectives and a brief description of the study design, including a figure or figures to show the project location and the locations of all sampling stations, including the reference stations, relative to existing features and the construction project site.

(b) A description of the methods employed in collecting, transporting, and analyzing water samples.

(c) Copies of all laboratory reports (these may be placed in an appendix of the summary report).

(d) A discussion summarizing results of the laboratory analyses. This discussion shall include consideration of associated field data (see paragraphs 5.c and 5.e.(1)). Presentation of results shall include tabular and graphical presentations of the data by time, by location, and by depth. Tabular presentations of data shall include summary statistics (e.g., means, standard deviations) where this is judged by the PI to be appropriate.

(e) Conclusion(s), including a statement summarizing the degree of compliance or noncompliance with state water quality standards (Reference b) and the probable causes of any apparent violations. In reaching conclusions concerning degree of compliance with the state water quality standards and cause(s) of apparent violations, the Contractor shall conduct and consider the results of appropriate quantitative comparisons between the current field data obtained from project site monitoring stations and from control stations, and between the current data and baseline data (if any) previously provided by the Government. The method(s) to be used in conducting such comparisons shall include generally accepted statistical methods or other methods selected by the PI to be those which in his/her professional judgment are most appropriate for the purpose of ascertaining degree of compliance with the water quality standards. The method(s) used and results considered shall be described.

(4) One unbound original of the final written summary report, on standard-sized (8.5 x 11 inch) paper and suitable for photocopying, and four (4) bound copies of same, shall be submitted to the Government within thirty (30) days of the completion of the laboratory analyses of the last post-construction sample.

5. SPECIAL CONDITIONS.

a. The Contractor shall provide a Principal Investigator (PI) who is knowledgeable in the laboratories, methods, and procedures which will be used in the fulfillment of this contract. This person shall have a minimum of a master's degree in a field of science or engineering and two (2) years of environmental laboratory experience. The PI shall have a demonstrated knowledge of marine water quality testing methods and sampling requirements as well as applicable State of Hawaii and Federal regulations. Written appropriate proof of experience and academic qualifications for the PI shall be provided for Government review and approval.

b. The contractor's laboratory shall be acceptable to the State of Hawaii Department of Health.

c. The Contractor shall be responsible for the accuracy and validity of the data obtained in accomplishing this work. The Contractor without additional cost or fee to the Government, shall correct errors or deficiencies in his/her performance.

d. The Contractor shall make his/her sample storage and laboratory facilities as well as pertinent records relating to this contract available for inspection by Corps of Engineers representatives upon request.

e. The Contractor shall obtain any necessary Federal and State permits for the interisland transport of samples.

f. The Contractor shall retain unused portions of samples for a period of not less than sixty (60) days following the completion of submission of the summary report as discussed in section 4.e. above.

g. The sample containers and unused portions of samples shall be recycled or disposed of by the Contractor according to all applicable federal, state, and local regulations. The cost for disposal of samples and sample containers shall be borne by the Contractor with no additional cost to the government.

h. In event the government has the need for expert written opinion or testimony on data or reports furnished under this contract in conjunction with administrative or judicial proceedings, the Contractor shall furnish experts to provide such testimony, or attend conferences in this regard. If so required, modification to this contract will be negotiated to include appropriate terms and conditions.

i. The Contractor shall retain a copy of the laboratory report and the Raw Data Package for a minimum of seven years after submission of data. The Raw Data Package shall consist of field records, laboratory notebook pages, any relevant QA and QC data, and calibration and control data as applicable. The information must be sufficient to independently reconstruct the reported results and be in an easy-to-review format.

j. The Contractor shall take all safety measures and precautions necessary to protect his employees in accordance with OSHA standards and applicable state, local and federal regulations. The Contractor shall comply with the safety provisions of EM 385-1-1 (Reference d). If diving is necessary, then the Contractor shall prepare a Diving Plan and shall obtain approval of that plan from the District Dive Coordinator, CEPOH-UD, prior to undertaking the diving. Snorkeling, free diving requires a dive plan.

6. MATERIALS, TRANSPORTATION AND EQUIPMENT.

All materials, transportation, equipment, and personal protective equipment used by the Contractor shall be furnished by the Contractor.

7. CONFLICTS.

Any conflicts detected in any of the information furnished, shall be brought to the attention of the Authorized Representative of the Contracting Officer for resolution before proceeding with the work.

8. CHANGE IN PRINCIPAL INVESTIGATOR BY THE CONTRACTOR.

The Government shall be notified of proposed changes in the Principal Investigator and reserves the right to approve such changes on the basis of professional qualifications. Written appropriate proof of experience and academic qualifications for the new Principal Investigator shall be provided for Government review and approval.

9. RELEASE OF INFORMATION.

The information developed, gathered and assembled in fulfillment of the contract requirements as defined in or related to the Scope of Work shall not be released by the Contractor, his consultants, his sub-consultants, his sub-contractors, or their associates without prior coordination with and approval by the Contracting Officer or his designee.

10. USE OF INFORMATION.

The information developed, gathered and assembled in fulfillment of the contract requirements as defined in or related to the Scope of Work shall become the property of the Government and shall, therefore, not be used by the Contractor for any purpose at any time without the written consent of the Contracting Officer.

11. REFERENCES.

a. American Public Health Association. 1989. Standard Methods for the Examination of Water and Wastewater, 17th Edition.

b. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 54, Water Quality Standards.

c. Code of Federal Regulations (CFR), Title 40, Chapter 1 (EPA), Part 136 - Guidelines Establishing Test Procedures for the Analysis of Pollutants.

d. Department of the Army, U.S. Army Corps of Engineers. November 2003. Safety and Health Requirements Manual (EM 385-1-1).

e. State of Hawaii, Department of Health. April 7, 2000. General Monitoring Guideline for Section 401 Water Quality Certification Projects.

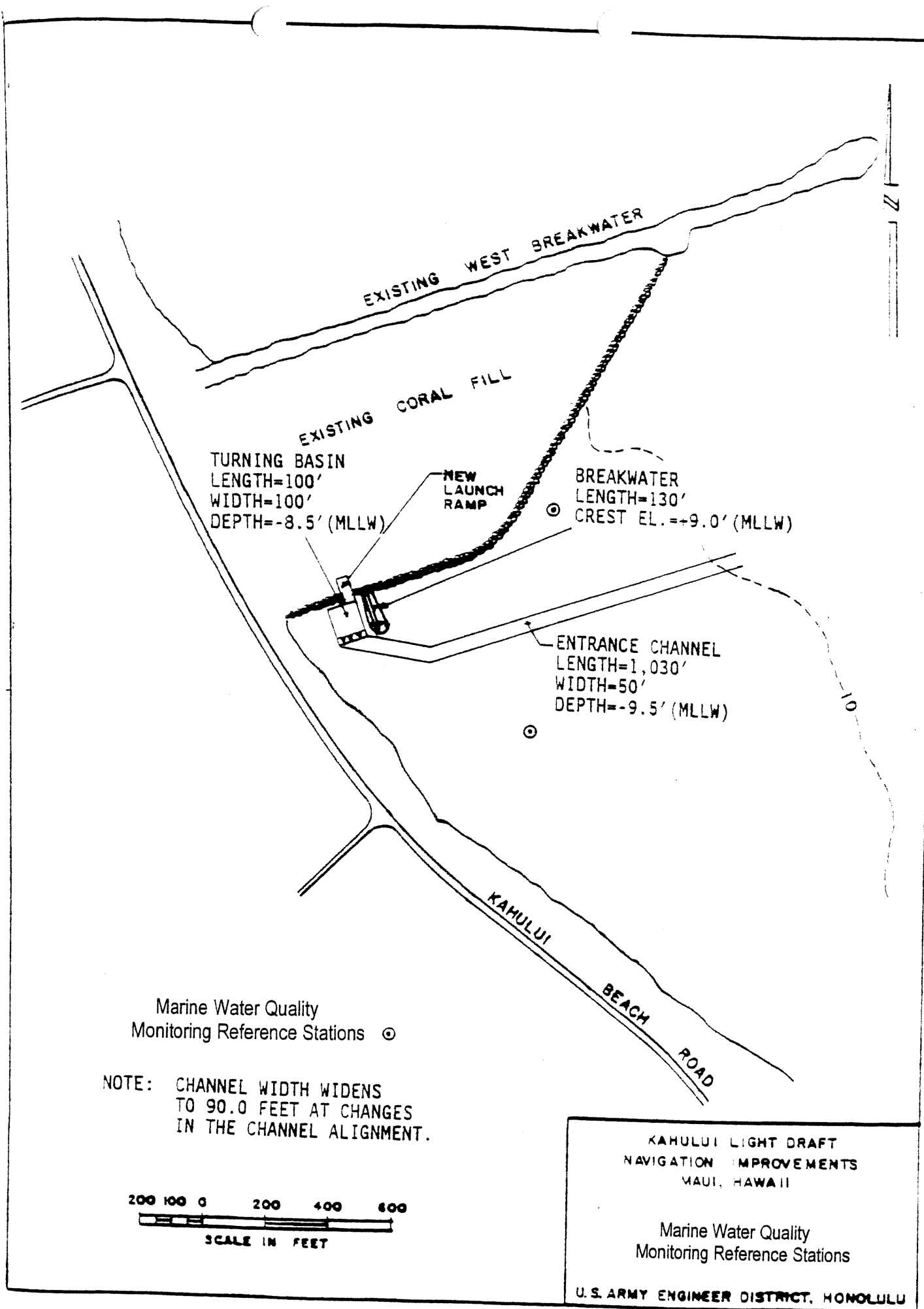


FIGURE 1

General Monitoring Guideline for Section 401 Water Quality Certification Projects

Period of Construction Project	<1 to 4 Months					≥5 Months to ≤4 Year					Construction Project Monitoring Frequency*		
Parameter to Monitor for "X" Months of "In-Water" Work	≤1	>1	2	3	4	≥5	1	2	3	≤4	Pre-	During	Post
Photo Documentation	✓										✓	✓	✓
pH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Turbidity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Suspended Solids (TSS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dissolved Oxygen (DO)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Salinity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Temperature	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Secchi Disc or Light Extinction	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Biological Monitoring	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Nitrate + Nitrite Nitrogen (NO ₃ ,NO ₂)	○	○	○	○	○								
Total Kjeldahl Nitrogen (TKN)	○	○	○	○	○								
Ammonia Nitrogen (NH ₄)	○	○	○	○	○								
Total Nitrogen (TN)	○	○	○	○	○								
Ortho-Phosphate (PO ₄)	○	○	○	○	○								
Total Phosphorus (TP)	○	○	○	○	○								
Chlorophyll <i>a</i>	○	○	○	○	○								
Silicate	○	○	○	○	○								
Pesticides, PAHs, metals, etc.													
Other													
Monitoring Frequency	D	D	D	3W	3W	3W	2M	M	Q	Q	*	**	***

Symbol Legend	
✓	Basic water quality monitoring parameters
✓	Included with dredging projects, if no habitat loss or modification
✓	Optional per data evaluation suggesting no significant impact
✗	Optional per dredging projects
✗	Photo documentation on dredging project with some habitat loss or modification
✗	Bio-monitoring on dredging projects with habitat loss or modification
	To be determined on individual case
○	Optional per individual cases for dredging projects

Notes:

* Pre-construction sampling for TSS and Turbidity of TEN samples over TWO weeks for projects that impact bottom sediment.

** During construction monitoring is limited to length of "in-water" work period.

*** Post-construction monitoring is limited to once per construction period.

Shaded blocks represent basic or minimum requirement for most projects.

D = Daily
W = Weekly
M = Monthly
Q = Quarterly
(i.e., 3W = three times per week)

DEPARTMENT OF THE ARMY PERMIT 200000171

Permittee: State of Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation, 333 Queen Street, Room 300, Honolulu, Hawaii 96813

Permit No: 20000171

Issuing Office: U.S. ARMY CORPS OF ENGINEERS, Honolulu Engineer District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: This project is the State of Hawaii portion of a Corps of Engineers Civil Works project. The State's project consists of the demolition of the existing single lane launch ramp and portion of the shoreline revetment; construction of a new three lane launch ramp; construction of a catwalk 180 feet long; and reconstruction of the shoreline revetment.

Purpose: The overall purpose of the project is to provide commercial light-draft navigation improvements for the north side of the island of Maui..

Project Location: Kahului Harbor, Island of Maui, Hawaii.

General Conditions:

- CO
1. The time limit for completing the work authorized ends on **April 2, 2006**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least two months before the above date is reached.
 - CO/CC 2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
 - CC 3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State of Hawaii coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
 - CO 4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
 - CO/CC 5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit
 - CC 6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

See page 4.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

- (X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
- (X) Section 404 of the Clean Water Act (33 U.S.C. 1344).
- () Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.
- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
- c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
- d. Design or construction deficiencies associated with the permitted work.
- e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

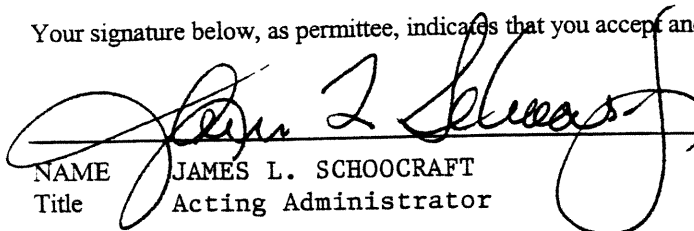
5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

- a. You fail to comply with the terms and conditions of this permit.
- b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
- c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

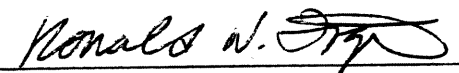
Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

 4/17/01
 NAME JAMES L. SCHOOCRAFT
 Title Acting Administrator (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

 4/19/01
 RONALD N. LIGHT
 Lieutenant Colonel, U.S. Army
 District Engineer (DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE)

PAGE 4

(DATE)

II. Special Conditions:

CO A. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

col/cc B. The mitigation measures proposed in the final Environmental Assessment (Section 5.7) will be fully implemented.
 (see attached)

CO C. Comply with all conditions in the Federal Coastal Zone Consistency Determination.

CC D. There will be no runoff from the work or loading area.

CC E. The following conditions shall be incorporated into the project to minimize impacts to fish and wildlife resources and water quality:

- (1) No project related materials shall be stockpiled in the marine environment.
- (2) All project related equipment and materials placed in the water shall be free of pollutants.
- (3) No contamination of the marine environment (from trash, debris disposal, etc.) shall result from project activities.
- (4) A contingency plan to control petroleum products accidentally spilled during the project shall be developed.
 Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of petroleum spills.
- (5) Turbidity and siltation from the proposed work shall be minimized and contained within the vicinity of the site through the use of effective silt containment devices and the curtailment of work during adverse weather conditions.

5.6 **LAND USE.** The project would have no effect on land use. The existing boat facility is part of the State DLNR Division of Boating and Recreation system. No changes in zoning or use of adjacent lands are expected to result from the proposed improvements to the boat launching facility.

co/cc 5.7 **MITIGATION.** During construction, the construction contractor will be required to adhere to applicable Federal, State of Hawaii and Maui County laws and regulations. This is a standard requirement in all Corps and State of Hawaii construction contract specifications. The contractor will be required to develop an environmental protection plan which will detail the measures to be used, based on the construction methods to be used, to comply with the regulations. This requirement for an environmental protection plan is standard in Corps construction contracts. The plan must be approved by the Corps Contracting Officer, who is responsible for insuring that the contract specifications and the contractor's required environmental protection plan will incorporate the following mitigative measures:

CC 5.7.1 In order to prevent excessive sediment transport into areas of significant living corals and other reef resources, construction-related turbidity will be confined to the immediate vicinity of construction through the use of effective silt containment devices.

CC 5.7.2 In-water construction will be curtailed during adverse sea conditions.

CC 5.7.3 All necessary temporary storage of construction-related materials will be above the influence of the tides.

CC 5.7.4 The dredged material will be disposed of on land and contained behind berms above the influence of the tides. Only clean runoff will be allowed to return to the ocean.

CC 5.7.5 All construction-related materials will be free of pollutants.

CC 5.7.6 Construction wastes, petroleum products, human wastes, and debris will not be permitted to fall, flow or leach into the ocean.

CC 5.7.7 If blasting is necessary, the charges will be sand-bagged to minimize incidental fish kills. No blasting will be conducted if humpback whales are observed within the breakwater structures of the Kahului Deep-Draft Harbor. No blasting will be conducted if green sea turtles are observed within 300 meters of the blast site.

CC 5.7.8 Dredged material stockpiles will be attenuated to facilitate exposure of algae and other biogenic materials to the sun and air to allow rapid drying, thus minimizing anaerobic decomposition and the unpleasant odoriferous biproducts associated with it.

BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
EMD/CWB

WQC346.FNL

January 26, 2001

Lt. Col. Ronald N. Light
District Engineer
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Mr. Gilbert Coloma-Agaran, Chairperson
Board of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809-0621

Dear Lt. Col. Light and Mr. Coloma-Agaran:

**Subject: Section 401 Water Quality Certification (WQC) for the
Kahului Harbor Light-Draft Navigation Improvements Project
Kahului, Maui, Hawaii
WQC 0000346/Army Authorization No. CW 95-0004 &
Army File No. 200000171**

In accordance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), Chapters 91, 92 and 342D, Hawaii Revised Statutes (HRS), Part 121 of Title 40, Code of Federal Regulations (CFR), and Chapter 11-54 of the Hawaii Administrative Rules (HAR), the Department of Health (Department) has reviewed your Section 401 WQC application and appurtenant data relevant to water quality considerations for the discharge activities. The subject activity is authorized under the U.S. Department of the Army, Honolulu Engineer District (HED), Civil Works Authorization No. CW 95-0004 and Army File No. 200000171. The processing of this application and the issuance of this WQC is based on the January 7, 1997 Memorandum of Agreement between the U.S. Army Corps of Engineers (COE), HED and the Department's Clean Water Branch (CWB).

The Director of Health (Director) attests to the following statements based on information contained in the Section 401 WQC application package.

08 MAR 2001
HED <i>ml</i> 3/16
DHED
SECY

Lt. Col. Ronald N. Light
Mr. Gilbert Coloma-Agaran, Chairperson
January 26, 2001
Page 2

1. The Director has either:
 - a. Examined the application submitted by the U.S. Army COE-HED and bases its certification upon an evaluation of the information contained in such application which is relevant to water quality considerations; or
 - b. Examined other information furnished by the U.S. Army COE-HED sufficient to permit the statement described in Item No. 2. below.
2. With the conditions imposed in Item 3. below, there is a reasonable assurance that the activity will be conducted in a manner which will not violate the Basic Water Quality Criteria applicable to all waters and the Specific Water Quality Criteria applicable to the class of State waters where the proposed discharge(s) would take place.
3. The following conditions are deemed necessary to be imposed with respect to the project activity authorized under the U.S. Army COE-HED Civil Works Authorization No. CW 95-0004 and Army File No. 200000171:
 - a. The discharges evaluated under this application are limited to those resulting from the following construction activities within the Kahului Harbor:
 - (1) Construction of a breakwater 130 feet long, with a crest elevation of (+)9.0 feet mean lower low water (MLLW) and crest width of 12.0 feet;
 - (2) Construction of an entrance channel 1,030 feet long, 50 feet wide, dredged to a depth of (-)9.5 feet MLLW;
 - (3) Construction of a turning basin measuring 100 feet by 100 feet, dredged to a depth of (-)8.5 MLLW;
 - (4) Construction of a three-lane boat launch ramp with two concrete catwalks, one 125 feet long and the other 50 feet long and a rock revetment on each side of the ramp;
 - (5) Removal of an existing rock groin;
 - (6) Removal of the existing single-lane boat launch ramp; and
 - (7) Dredging of the entrance channel and turning basin.

- b. Materials to be placed directly into Kahului Harbor or discharges resulting from the proposed construction activities evaluated under this Section 401 WQC application include the following:
- (1) Incidental discharges from the dredging of about 8,700 cubic yards of material from the harbor basin for the turning basin and the new entrance channel;
 - (2) Incidental discharges from the removal of the existing rock groin and single-lane boat launch;
 - (3) Placement of 2,500 cubic yards of the basalt stone to be used for the construction of the breakwater;
 - (4) Placement of twelve (12) pre-casted concrete piles for the construction of the two catwalks;
 - (5) Placement of twenty-four (24) 10-feet-by-15-feet pre-casted concrete sections to be used for the construction of the new three-lane boat launch ramp;
 - (6) Placement of 3 cubic yards of quarry rocks at the end of the launch ramp;
 - (7) Placement of 250 to 2,000 pound stones and a 12-inch underlayer of filter rocks for the construction of the rock revetment on either side of the new boat launch ramp;
- c. This Section 401 WQC shall become valid only when the following condition has been satisfied:

CC A complete Environmental Protection Plan, as required in Section 01430 of the "Specifications" (dated April 2000) has been submitted to the CWB for review and comment and all related concern(s) and comment(s) are properly addressed to the Director's satisfaction. A copy of the final Environmental Protection Plan shall be submitted to the CWB.

The CWB shall have at least thirty (30) days to review and comment after receiving a copy of the complete Environmental Protection Plan.

A complete Environmental Protection Plan shall, at a minimum, include the following information:

- (1) A project-related site-specific and construction method-specific Best Management Practices Plan which shall, at a minimum, include the following descriptions:
 - (a) Site characterization;
 - (b) Construction sequence;
 - (c) Construction method;
 - (d) Characteristics of the discharge and potential pollutants associated with the proposed construction activity; and
 - (e) Proposed control measures or treatment;
 - (2) An applicable monitoring plan;
 - (3) A detailed dredging plan;
 - (4) A dewatering, treatment, and effluent monitoring plan, if applicable; and
 - (5) Additional mitigative/compensatory measures, controls or treatment measures, or contingency plan needed because of the construction method used or other unforeseen circumstances;
- d. This Section 401 WQC:
- (1) Shall remain valid for two (2) years from the date of this letter or until the applicable State Water Quality Standards is revised or modified or the applicable Department of the Army permit expires or is revised or modified, whichever is earlier. If the applicable State Water Quality Standards is revised or modified during the two (2) year period and such that the activity complies with the revision(s) or modification(s), this Section 401 WQC shall continue to be valid for the remainder of the two (2) year period.
 - (2) May be revoked at the Director's discretion or when any of the following is identified:
 - (a) The U.S. Army COE-HED shall comply with all new water quality standards as adopted by the Department. In any case where:

- (i) Water quality standards applicable to the waters into which the activity may discharge are subsequently established before the activity is completed; or
- (ii) The Director determines that the activity is violating water quality standards;

The CWB shall notify the U.S. Army COE-HED of the violation or noncompliance with the new water quality standards. The U.S. Army COE-HED shall cease the violation or noncompliance within one hundred eighty (180) days of the date of the notice. If the U.S. Army COE-HED fails within one hundred eighty (180) days of the date of the notice to cease the violation or noncompliance, the Director may revoke this certification, at the Director's discretion;

- (b) The discharge(s) from the activity is in violation or noncompliance with any existing water quality standards or condition of this Section 401 WQC. The CWB shall notify the U.S. Army COE-HED of the violation or noncompliance. The U.S. Army COE-HED shall cease the violation or the noncompliance within seven (7) days of the date of the notice. If the U.S. Army COE-HED fails within seven (7) days of the date of the notice to cease the violation or noncompliance, the Director may revoke this certification, at the Director's discretion;
- (c) The Section 401 WQC was obtained by misrepresentation, or there was a failure to disclose fully all relevant facts;
- (d) There is a change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge; or
- (e) It is in the public interest.

e. The U.S. Army COE-HED shall:

- (1) Invite the Department's representative(s) to attend the partnering, pre-construction or any other similar type of meeting that is established for the proposed construction activities;

CO

- CC (2) Notify the CWB [via telephone no. (808) 586-4309] and the Maui District Health Office [via telephone no. (808) 984-8234] at least three (3) working days before any construction work is to begin;
- CC (3) Comply and shall also require the contractor(s) to comply with applicable specifications, schedules, procedures, approved Environmental Protection Plan, Best Management Practices Plan, and any other project construction related requirements, or information contained in the Section 401 WQC application dated October 2, 1996 and updated July 21, 2000 and September 20, 2000 and other submittals;
- CC (4) Conduct or contract with a qualified laboratory/environmental consultant to conduct applicable monitoring in accordance with its monitoring plan, dated August 5, 1996, revised October 29, 1998 and July 20, 2000;
- CC (5) Ensure that silt curtain(s) or other appropriate and effective silt containment device(s) be properly deployed prior to the commencement of any section of the in-water construction work, including dredging activities; be properly maintained throughout the entire period of the section of the in-water construction work; and not be removed until the section of the in-water work is completed and the water quality in the affected area has returned to its pre-construction condition;
- CC (6) Not commence any dredging activity unless:
- (a) Silt curtain(s) or other appropriate and effective silt containment device(s) has been properly deployed;
 - (b) A detailed dredging plan has been submitted to the CWB for review and comment and all dredging related concern(s) and comment(s) are properly addressed to the Director's satisfaction.

The detailed dredging plan shall, at a minimum, include the following information:

- (i) Method and equipment to be used for the proposed dredging;
- (ii) Method and sequence to be used for dredged spoils transportation and handling;

(iii) Method and location for the dredged spoils dewatering process; and

(iv) Identification of the exact location and design of the pollution control measures to be used on a 8½" X 11" map;

CC (7) Ensure that all "discharges" associated with the proposed Kahului Harbor Light-Draft Navigation Improvements construction activities be conducted in a manner that will comply with the "Basic Water Quality Criteria Applicable to All Waters" as specified in HAR, Section 11-54-04(a) ;

CC (8) Ensure that all material(s) placed or to be placed in State waters be free of waste metal products, organic materials, debris and any pollutants at toxic or potentially hazardous concentrations to aquatic life as identified in HAR, Section 11-54-04(b);

CC (9) Ensure that construction debris be contained and prevented from entering or re-entering State waters;

CC (10) Cease immediately the portion of the construction work or discharge that is causing:

(a) Noncompliance with HAR, Section 11-54-04(a) or HAR, Section 11-54-04(b); or

(b) Damage or will cause damage to the live coral;

The U.S. Army COE-HED shall not resume the portion of the construction work or discharge until adequate mitigative measures are implemented and appropriate corrective actions are taken and concurred by the Department;

CC (11) Report immediately any spill(s) or other contamination(s) that occurs at the project site to the CWB;

CO (12) Notify the CWB within fourteen (14) days after the completion of the proposed construction activities; and

CC (13) Ensure that all temporarily constructed facilities or structures, including the silt containment device(s), be removed immediately after the completion of the in-water construction and when the water quality in the affected area has returned to its pre-construction condition.

- CC f. Work shall be discontinued during flood conditions.
- CC g. Clearing and grubbing shall be held to the minimum.
- CC h. There shall be no blasting or explosives used for the dredging process.
- co/cc i. The effectiveness and adequacy of the implemented Best Management Practices and/or environmental protection measures shall be reviewed and updated as often as needed. Any change(s) to the approved Environmental Protection Plan, Best Management Practices Plan, or Applicable Monitoring Plan or correction(s) or modification(s) to information already on file with the Department shall be submitted to the CWB, for review and comment, as such change(s), correction(s) or modification(s) arise. The U.S. Army COE-HED shall properly address the CWB's comment(s) and/or concern(s) to the Director's satisfaction before such change(s), correction(s) or modification(s) become effective.
- CC j. By applying for and accepting the Section 401 WQC, the U.S. Army COE-HED agrees that the Department may conduct routine inspection of the construction site in accordance with HRS, Section 342D-8.
- CC k. Demolition debris and/or dredged spoils shall be removed from the aquatic environment and be disposed of at the upland State or County approved sites. A Solid Waste Disclosure Form for Construction Sites shall be completed and returned to the Department's Office of Solid Waste Management. No construction material or construction-related materials shall be stockpiled, stored or placed in the aquatic environment or stored or placed in ways that will disturb the aquatic environment.
- CC l. Return flow or runoff from the dredged spoil dewatering process or from the stockpiling site shall be contained on land and not be allowed to enter State waters. Should the discharge of the return flow or runoff from the dredged spoil dewatering site be unavoidable, it shall be properly handled in such a manner that the effluent discharges will comply with the applicable State Water Quality Standards. A detailed dewatering design and discharge plan, including applicable effluent monitoring program, shall be submitted to the CWB for review and comment. This dewatering plan may be incorporated into the contractor's dredging plan as part of the Environmental Protection Plan.
- co/cc m. The U.S. Army COE-HED shall obtain a National Pollutant Discharge Elimination System (NPDES) permit for any discharge(s) that is regulated pursuant to Section 402 of the Act; HRS, Chapter 342; Title 40 CFR; and HAR, Chapter 11-55.

- CC n. Benchmarks shall be established prior to the commencement of any breakwater construction work and shall act as photograph stations to allow the comparison of the site conditions before and after the construction of the breakwater. In addition to the required water chemistry monitoring, photographs shall be taken before and after the completion of the breakwater construction. Copies of the photographs taken should note the date and time they were taken. Photographs taken before the project construction shall be submitted to the Department together with the required site-specific Best Management Practices Plan. Photographs taken after the construction shall be submitted to the Department within two (2) weeks after the completion of the construction project.
- CC o. There shall be no wash of any stones or concrete slabs or piles, either from on-site or off-site, in State waters. Effluent from any washing activity shall be properly contained and treated on land and not be discharged, either directly or indirectly, into State waters unless a NPDES permit issued under the authorization of Section 402 of the Act is obtained.
- CC p. Effluent from the concrete slab and pile casting process shall be properly contained and treated on land and not be discharged, either directly or indirectly, into State waters unless a NPDES permit issued under the authorization of Section 402 of the Act is obtained.

The U.S. Army COE-HED has published a Notice of Proposed Section 401 WQC in the Hawaii State and County Public Notices on December 11, 2000 for the subject activity.

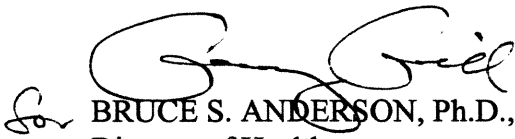
After consideration of the expressed views of all interested persons and agencies and pertinent State statutes and rules, the Department hereby issues this Section 401 WQC to the U.S. Army COE-HED for its Civil Works Authorization No. CW 95-0004 and the Board of Land and Natural Resources for Army File No. 200000171.

The Department of Health may, on a case-by-case basis and upon the applicant's written request, administratively extend the expiration date of the Section 401 WQC for the subject project, if the Department of Health determines that there are no significant change(s) to the project scope and the change(s) will not, either individually or accumulatively, cause adverse impacts to the receiving water quality.

Lt. Col. Ronald N. Light
Mr. Gilbert Coloma-Agaran, Chairperson
January 26, 2001
Page 10

Enclosed are two original copies of the Section 401 WQC. Please sign and date one and return it to the CWB. Should you have any questions, please contact Mr. Shane Sumida, Engineering Section of the CWB, at (808) 586-4309.

Sincerely,


BRUCE S. ANDERSON, Ph.D., M.P.H.
Director of Health

WE AGREE WITH THE TERMS AND CONDITIONS OF THIS LETTER:

Ronald N. Light LTC, EN
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT ENGINEER

MARCH 16, 2001
Date

Enclosures: 1. Solid Waste Disclosure Form for Construction Sites
2. Monitoring Plan (dated July 20, 2000)

c: State DBEDT, CZM Program (w/o encls.)
State DLNR, Small Boat Harbor Div. (w/o encls.)
State DLNR, DAR (w/o encls.)
State DOH, SHWB (w/o encls.)
State DOT, Harbors Div. (w/o encls.)
DHSA, Maui (w/o encls.)
Chief, DEHP, Maui (w/encl. #2)



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EMD / CWS

01039CSS.03

January 21, 2003

Lt. Col. David C. Press
District Engineer
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Mr. Eric Hirano, Acting Chairperson
Board of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809-0621

Dear Lt. Col. Press and Mr. Hirano:

Subject: Section 401 Water Quality Certification (WQC)
Kahului Harbor Light-Draft Navigation Improvements Project
Kahului, Maui, Hawaii
WQC 0000346/Army Authorization No. CW 95-0004 &
Army File No. 200000171

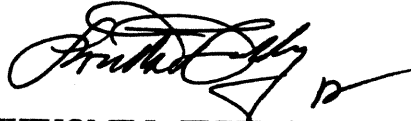
This letter is to inform you that the expiration date of the subject Section 401 WQC has been extended to September 30, 2004. All other terms and conditions of the Section 401 WQC shall remain unchanged.

The granting of this approval is based on the subject Section 401 WQC issued by the Department of Health on January 26, 2001; written request, dated November 1, 2002, from Mr. Ray H. Jyo, Deputy District Engineer for Programs and Project Management of the U.S. Army Engineer District, Honolulu; and based on the understanding that there were no changes to information already on file that will affect the initial Section 401 WQC determination since its issuance.

Lt. Col. David C. Press
Mr. Eric Hirano, Acting Chairperson
January 21, 2003
Page 2

Should you have any questions, please contact Mr. Shane Sumida of the Engineering Section, Clean Water Branch, at (808) 586-4309.

Sincerely,



CHIYOME L. FUKINO, M.D.
Director of Health

- c: Ms. Sharon Ishikawa, Civil and Public Works Branch, *Si 1/23/03*
U. S. Army Engineer District, Honolulu
Mr. Manuel Emiliano, Division of Boating and Ocean Recreation,
Department of Land and Natural Resources
CZM Program, Office of Planning,
Department of Business, Economic Development, and Tourism
Division of Aquatic Resources, Department of Land and Natural Resources
Solid and Hazardous Waste Branch, Department of Health
Harbors Division, Department of Transportation
DHO, Maui



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

January 14, 2004

Lt. Col. David C. Press
U.S. Army Corps of Engineers
Honolulu Engineer District
Building 230
Fort Shafter, Hawaii 96858-5440

DATE	INFO
2/10/04	100
Ref	100
CO	100
CW	100

In reply, please refer to:
EMD / CWB

R10B726.FNL

Dear Lt. Col. Press:

Subject: NOTICE OF GENERAL PERMIT COVERAGE (NGPC)
National Pollutant Discharge Elimination System (NPDES)
Kahului Light Draft Navigational Improvements, Ph. II - Harbor Improvements
Kahului Beach Road, Kahului, Maui, Hawaii
File No. HI R10B726

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. § 1251 et seq.; the "Act"); Chapter 342D, Hawaii Revised Statutes; and Chapters 11-54 and 11-55, Hawaii Administrative Rules (HAR), Department of Health (DOH), State of Hawaii,

U.S. ARMY CORPS OF ENGINEERS
HONOLULU ENGINEER DISTRICT

(hereinafter "PERMITTEE")

is authorized to discharge storm water associated with construction activities from the subject project located at Kahului Beach Road, Kahului, Maui, Hawaii, to Kahului Harbor, a Class A, Marine Water, Embayment, at coordinates: Latitude 20°53'53"N and Longitude 156°28'47"W.

The Permittee shall:

1. Comply with HAR, Chapter 11-55, Appendix C, NPDES General Permit Authorizing Discharges of Storm Water Associated with Construction Activities (enclosed).
2. Comply with HAR, Chapter 11-55, Appendix A, DOH, Standard General Permit Conditions (enclosed).

3. Comply with HAR, Chapter 11-55, Sections 11-55-34.04(a), 11-55-34.07, 11-55-34.11, 11-55-34.12 (enclosed), and any other sections applicable to the subject activity.
4. Comply with all materials submitted in and with the retained copy of the Notice of Intent (NOI), dated December 15, 2003, and additional information, dated January 5, 2004.
5. Submit any changes to information on file with the Clean Water Branch (CWB) as soon as such changes arise, and properly address all related concerns and/or comments to the CWB's satisfaction.
6. Submit the following site-specific information for construction on CWB-NOI Form C (Rev. 11/20/2002) to the CWB for review and comment at least 30 days before the start of construction activities: *(see attachment 6a)*
 - a. Section 3 - General Contractor Information;
 - b. Section 7.c. - Non-Storm Water Handling Method: Provide the locations and details of the retention ponds where suspended material can be settled out or the water evaporates so that pollutants are separated from the water. Effluent discharges, either overflows or runoff, from the retention ponds are not permitted under this NGPC.;
 - c. Section 10.d. - RCRA Permit (Hazardous Wastes): Provide the status and corresponding file number on any existing or pending permit, as applicable;
 - d. Section 15 - Construction BMPs Plan, including:
 - i. Section 15.a.iv. - Facility Site Map: Provide the location(s) and descriptions of all structural controls including those that will be used to divert the offsite storm water from flowing into the construction site;
 - ii. Sections 15.b. and 15.c. - Site-Specific Construction BMPs plan with an updated timetable for major construction activities including the dates when the contractor will begin and end site disturbance, and when erosion control measures will be implemented and removed.; and
 - e. Section 18 - Authorization of Representative, as applicable (may be General Contractor or any other person). As of the date of this NGPC, Mr. Ray Jyo, Deputy District Engineer for Programs and Project Management, is no longer recognized as the duly authorized representative.

All related concerns and/or comments pertaining to the above listed items shall be properly addressed to the DOH's satisfaction before the start of construction activities.

Lt. Col. David C. Press
January 14, 2004
Page 3

7. Complete and submit the enclosed Solid Waste Disclosure Form for Construction Sites to the Office of Solid Waste Management as specified on the form.
8. Complete and submit the Notice of Cessation Form (CWB-NOC Form) to the CWB within two (2) weeks of completion of the subject project. The CWB-NOC Form can be downloaded from our website at:
<http://www.hawaii.gov/doh/eh/cwb/forms/pdf-files/cwb-noc.pdf>.

This NGPC will take effect on the date of this notice. This NGPC will expire at midnight, November 6, 2007, or when amendments to HAR, Chapter 11-55, Appendix C, are adopted, whichever occurs first. Any non-compliance with the conditions of this NGPC may be subject to penalties of up to \$25,000 per violation per day.

This NGPC does not obviate the need to obtain other Federal, State, or local authorizations required by law.

If you have any questions, please contact Ms. Joanna L. Seto of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,



THOMAS E. ARIZUMI, P.E., CHIEF
Environmental Management Division

- Enclosures:
1. HAR, Sections 11-55-01 and 11-55-34 to 11-55-34.12
 2. HAR, Chapter 11-55, Appendices A and C
 3. Title 40, Code of Federal Regulations Citations as referenced in HAR, Chapter 11-55, Water Pollution Control, Appendix A
 4. Solid Waste Disclosure Form for Construction Sites (attachment 6b)
 5. Receipt No. 06188 for \$500 Filing Fee

- c: Ms. Sharon Ishikawa, Project Manager, U.S. Army Corps of Engineers, HED (w/o encls.)
[via fax 438-0430 only]
Ms. Nani Shimabuku, Civil and Public Works Branch, U.S. Army Corps of Engineers, HED
(w/o encls.) [via fax 438-0430 only]
DHO, Maui (w/ copy of NOI only)
Office of Solid Waste Management, DOH (w/o encls.)



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

January 5, 2004

REPLY TO
ATTENTION OF:

Civil and Public Works Branch
Programs and Project Management Division

Mr. Denis Lau
Chief, Clean Water Branch
State Department of Health
919 Ala Moana Boulevard, Room 301
Honolulu, Hawaii 96814-4920

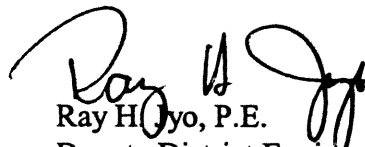
Dear Mr. Lau:

As requested, I am enclosing for your review and approval the revised CWB-NOI Form C Permit Application for the Kahului Light Draft Navigational Improvements, Phase II - Harbor Improvements Project. Item 5a has been revised to include the classification of "embayment."

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have questions regarding the enclosed materials, please feel free to contact Ms. Sharon Ishikawa of my Civil and Public Works Branch staff at 438-2249.

Sincerely,



Ray H. Jyo, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosure

Attachment 6a



State of Hawaii, Department of Health, Clean Water Branch

CWB-NOI Form C

Notice of Intent for HAR, Chapter 11-55, Appendix C - NPDES General Permit Coverage Authorizing Discharges of Storm Water Associated With Construction Activities (as defined in 40 CFR §§122.26(b)(14)(x) and 122.26(b)(15)(i))

Before completing this form, read the General Guidelines for CWB-NOI Forms and Guidelines for CWB-NOI Form C. Alteration of the text in this form may delay the processing of this submittal.

1. Owner Information (see Guidelines for CWB-NOI Form C - Note 1)

Legal Name: U.S. Army Corps of Engineers, Honolulu Engineer District

Mailing Address: Building 230

City, State and Zip Code+4: Fort Shafter, Hawaii 96858-5440

Street Address: Bldg 230

City, State and Zip Code+4: Fort Shafter, Hawaii 96858-5440

Contact Person & Title: Sharon Ishikawa (Project Manager)

Phone No.: (808) 438-2249 Fax No.: (808) 438-0430

Email Address: sharon.ishikawa@usace.army.mil

2. Owner Type (see Guidelines for CWB-NOI Form C - Note 2)

City ☐ County ☐ State ☐ Federal ☒ Private ☐ Other ☐

If "Other" is checked, specify the type below:

3. General Contractor Information (see Guidelines for CWB-NOI Form C - Note 3)

Legal Name: To Be Determined

Mailing Address: _____

City, State and Zip Code+4: _____

Street Address: _____

City, State and Zip Code+4: _____

Contact Person & Title: _____

Phone No.: () _____ Fax No.: () _____

☒ The general contractor information will be submitted 30 days before the start of construction activities.

4. Project Information (see Guidelines for CWB-NOI Form C - Note 4)

Legal Name: Kahului Light Draft Navigational Improvements, Phase II – Harbor Improvements

Mailing Address: Building 230

City, State and Zip Code+4: Fort Shafter, Hawaii 96858-5440

Street Address: Kahului Beach Road

City, State and Zip Code+4: Kahului, Maui, Hawaii 96732

Contact Person & Title: Sharon Ishikawa (Project Manager)

Phone No.: (808) 438-2249 Fax No.: (808) 438-0430

Island: Maui

Tax Map Key No(s).			
Zone	Section	Plat	Parcel(s)
3	7	1	23

5. Receiving State Water(s) Information (see Guidelines for CWB-NOI Form C - Note 5)

a. Receiving State Water Name: Kahului Harbor

Discharge Point Coordinates into the Receiving State Water:

Latitude: ° ′ ″ N Longitude: ° ′ ″ W

Classification: (check the appropriate space(s))

Inland: Class 1 ☐ Class 2 ☐ and Estuary ☐

Marine: Class AA ☐ Class A ☒ and Embayment ☒

b. Are there additional discharge points into receiving State waters?

No ☒ Yes ☐ If yes, provide the information requested in Item 5.a. on a separate sheet.

c. Does the discharge initially enter a separate storm water drainage system?

No ☒ Yes ☐ If yes, provide the following information. Attach a separate sheet with the requested information if there is more than one (1) discharge point into the separate storm water drainage system.

i. Drainage System Owner's name: _____

ii. Discharge Point Coordinates into the Drainage System:

Latitude: " N Longitude: " W

iii. A copy of the permit, license, or equivalent written approval granted by the owner(s) of the drainage system(s) allowing the subject discharge to enter their drainage system(s) is attached.

Yes ☐ No, ☐ an explanation is attached.

6. Quantity of Storm Water Discharge (see Guidelines for CWB-NOI Form C - Note 6)

5.63 cfs (Refer to Attachment 1 (Item 6), entitled "Design Analysis" dated 8/00)

7. Non-Storm Water Information (see Guidelines for CWB-NOI Form C - Note 7)

a. Source(s) of the non-storm water: Wash down of construction equipment and dewatering dredged material.

b. Does the non-storm water discharge into receiving State water(s)?

☐ Yes If yes, the construction activity may be subject to individual NPDES permit requirements. Contact the CWB for details.

☒ No If no, complete 7.c.

c. Non-storm water handling method:

Waste waters directly derived from dewatering dredged material and other construction activities will not be allowed to enter State waters.

These waste waters shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates so that pollutants are separated from the water.

Refer to Attachment 2 (Item 7.c), entitled "Section 01430, Environmental Protection", 11 pages.

8. Location Map (see Guidelines for CWB-NOI Form C - Note 8)

A topographic map or maps of the area which clearly show the following is/are attached (Refer to Attachment 3 (Item 8), 5 pages)

Yes ☒ No ☐

a. Legal boundaries of the project site,

b. Location and identification number of each of the project site's existing and/or proposed outfalls or discharge points, and

- c. Receiving State water(s) and receiving storm water drainage system(s), if applicable, identified and labeled.

9. Flow Chart (see Guidelines for CWB-NOI Form C - Note 9)

A flow chart or line drawing showing the general route taken by storm water through the project site is attached (Refer to Attachment 4 (Item 9), entitled "Design Analysis" dated 8/00)

Yes ☒ No ☐

10. Existing or Pending Permits, Licenses, or Approvals (see Guidelines for CWB-NOI Form C - Note 10)

Provide the status and corresponding file numbers on any existing or pending environmental permits.

- a. Other NPDES Permit or NGPC File No.: None
- b. DA Permit: 200000171 (Army authorization number CW95-0004)
- c. Section 401 WQC: File Number WQC0000346
- d. RCRA Permit (Hazardous Wastes):
- e. Facility on SARA 313 List (identify SARA 313 chemicals on site): None
- f. Other (Specify): None

11. NGPC Renewal (see Guidelines for CWB-NOI Form C - Note 11)

Is this an application for NGPC renewal?

No ☒ Yes ☐ If yes, provide the assigned File No.:

12. Automatic Coverage Under General Permit (see Guidelines for CWB-NOI Form C - Note 12)

- a. ☐ I elect to claim automatic coverage per HAR, Section 11-55-34.09(f).
- b. ☒ I elect to waive automatic coverage per HAR, Section 11-55-34.09(g).

13. Construction Site Characterization (see Guidelines for CWB-NOI Form C - Note 13)

- a. Describe the scope of the construction activity, including a proposed timetable for major activities with the date when the contractor will begin the site disturbance.

Scope of work includes the following activities: removing the existing concrete launching ramp, wooden loading doc and existing rock groin; installing new concrete launching ramps & loading docks, accessibility ramp; new breakwater, new trailer turnaround, new area lighting; landscaping entrance areas; and dredging of the channel and turning basin.

The following activities will be done on the land: constructing the new trailer turnaround, the upper portions of the launching ramp and loading docks; installing new area lighting; and landscaping.

Construction contract is currently scheduled to be awarded in February 2004, with the field work starting in March 2006 and completed March 2006.

b. Describe the history of the land use

The peninsula that the project is on was created in 1962 with the dredging from the deepening of Kahului Harbor. The filled peninsula is mostly undeveloped, with approximately 8 to 13 feet in elevations, relatively flat and revetted and is used for parking by fishermen and recreational boaters.

c. Describe the pollution source(s) in the history and corrective measures

The area is presently used as a light draft boat harbor. The only utilities on the peninsula are electrical for lights and water for the wash down area. The one transformer noted at the site did not displace any apparent signs of leakage. There are no fueling or sewage pump-out stations on this peninsula that could be a source of Hazardous, Toxic and Radioactive Waste (HTRW).

14. Construction Site Area (see Guidelines for CWB-NOI Form C - Note 14)

a. Total area of the site: 8.0 acres

b. Total disturbance area (i.e. clearing, excavating, grading, grubbing, storage, staging, etc.):
4.2 acres

c. Impervious area of the site after construction is completed: 0.8 acres

15. Construction Best Management Practices (BMPs) Plan (see Guidelines for CWB-NOI Form C - Note 15)

a. Project Site Map (see Guidelines for CWB-NOI Form C - Note 15.a.)

i. Will construction be done in phases?

No ☒ Yes ☐

If yes, a phasing map identifying each phase of the multi-phase construction project and the boundaries of each phase is attached:

Yes ☐ No ☐

ii. A facility site map(s) which shows the following information is attached (Refer to Attachment 5 (Item 15.ii), 3 drawings entitled "General Site Plan," "Landscape Plan," and "Real Estate Acquisition Map w/ Topo")

Yes ☒ No ☐

- (1) Approximate slopes anticipated after major grading activities;
- (2) Areas of soil disturbance;

- (3) Drainage patterns;
- (4) The location(s) of impervious structures (including buildings, roads, parking lots, etc.) after construction is completed;
- (5) Wetlands and other State water(s);
- (6) The boundaries of 100-year flood plans, if determined;
- (7) Areas used for the storage of soils or wastes;
- (8) The location(s) where stabilization practices are expected to occur;
- (9) The location(s) and descriptions of all structural controls including those that will be used to divert the offsite storm water from flowing into the construction site and;
- (10) The areas where vegetative practices are to be implemented.

Note: Items (1) through (6) shall be submitted with the NOI. If items (7) through (10) are not available at the time of NOI submittal, the information may be submitted at least 30 days before the start of construction activities.

- iii. Indicate which items are not applicable (use item numbers above): 3, 6
- iv. Indicate which items will be submitted 30 days before the start of construction activities (use item numbers above): 9

- b. The construction BMPs plan is attached on separate sheets with reference to Item 15.b.

Yes ☒ No ☐

The construction BMPs plan shall provide information requested in the Guidelines for CWB-NOI Form C - Note 15.b. by describing methods to minimize erosion of soil and discharge of other pollutants into State waters and, after completion of the construction activity, removal procedures for the construction site BMPs.

- i. Construction Activity - Describe the nature of the construction activity.
 - (1) What is to be constructed and the construction sequence?
 - (2) If the project is a multi-phase construction project, include a list of each phase.
 - (3) What type of materials and heavy equipment will be used for the construction activity?
- ii. Quality of Discharge - Describe the nature of the fill material to be used and existing data describing the soil or the quality of any discharge from the project site.
- iii. Potential Pollutant(s) - Identify all the potential pollutant(s) that will be generated by the proposed construction activities and the proposed control measures or treatment, as applicable. These pollutants may include, but are not limited to:
 - (1) Construction debris, removed vegetation;
 - (2) Discharges associated with the operation and maintenance of the equipment, such as oil, fuel and hydraulic fluid leakage;
 - (3) Soil erosion from the disturbed areas and stockpile areas;
 - (4) Any non-storm water discharges, that are not described under item 7;

(5) Location(s) of oil, fuel or any hazardous material storage site(s) and containment structure(s); and

(6) Other.

iv. Controls for Land Disturbances - The owner and/or general contractor shall comply with all conditions as stated in HAR, Chapter 11-55, Appendix C, under Special Conditions for Land Disturbances. The Department suggests including the language described in Note 15.b.iv. of the Guidelines for CWB-NOI Form C in the BMPs plan. It may be amended to be site-specific (i.e., type of cover to be used).

v. Erosion and Sediment Control Requirements - If applicable, submit the county-approved erosion and sediment control plan as appropriate for the activity and a schedule for implementing each control with the NOI or 30 days before the start of construction activities.

vi. Construction Schedule - Attach the proposed construction schedule which shall include, at a minimum:

(1) The date when the general contractor will begin and end the site disturbance;

(2) Dates when erosion control measures will be implemented and removed; and

(3) The dates when major construction activities begin and end.

c. ☐ The Site-Specific Construction BMPs Plan is submitted as an attachment to the CWB-NOI Form C.

☒ The Site-Specific Construction BMPs Plan will be submitted 30 days before the start of construction activities.

16. Post-Construction Pollutant Control Measures (see Guidelines for CWB-NOI Form C - Note 16)

The descriptions of measures that will minimize the discharge of pollutants via storm water discharge after construction operations have been completed are attached on a separate sheet with reference to Item 16. (Refer to Attachment 6 (Item 16), entitled "Item 16")

Yes ☒ No ☐

17. Additional Information (see Guidelines for CWB-NOI Form C - Note 17)

18. Authorization of Representative (see Guidelines for CWB-NOI Form C - Note 18)

Alteration of this item will result in the invalidation of the authorization statement(s).

- a. This statement authorizes the named individual or any individual occupying the named position of the company/organization listed below to act as our representative to process the required CWB-NOI Form for coverage under the NPDES general permit to discharge to State waters from the subject facility. The Owner hereby agrees to comply with and be responsible for all NGPC conditions.

Company/Organization Name: U.S. Army Corps of Engineers, Honolulu District

Mailing Address: Bldg 230

City, State and Zip Code+4: Fort Shafter, Hawaii 96818-5440

Street Address: Bldg 230

City, State and Zip Code+4: Fort Shafter, Hawaii 96818-5440

Authorized Contact Person & Title: Mr. Ray Jyo, P.E. Deputy District Engineer for Programs and Project Management

Phone No.: (808) 438-1634

Fax No.: (808) 438-7025

- b. This statement authorizes the named individual or any individual occupying the named position of the company/organization listed below to act as our representative to process the required CWB-NOI Form for coverage under the NPDES general permit to discharge to State waters from the subject facility. Our representative is further authorized to fulfill all conditions of the NGPC. The Owner hereby agrees to comply with and be responsible for all NGPC conditions.

Company/Organization Name: _____

Mailing Address: _____

City, State and Zip Code+4: _____

Street Address: _____

City, State and Zip Code+4: _____

Authorized Contact Person & Title: _____

Phone No.: () _____

Fax No.: () _____

- c. This statement authorizes the named individual or any individual occupying the named position of the company/organization listed below to act as our representative to fulfill all conditions of the NGPC for the subject facility. The Owner hereby agrees to comply with and be responsible for all NGPC Conditions.

Company/Organization Name: _____

Mailing Address: _____

City, State and Zip Code+4: _____

Street Address: _____

City, State and Zip Code+4: _____

Authorized Contact Person & Title: _____

Phone No.: () _____ Fax No.: () _____

- d. ☐ A separate statement is attached.

19. Certification (see Guidelines for CWB-NOI Form C - Note 19)

Alteration of this item will result in the invalidation of this CWB-NOI Form submittal. The person certifying this CWB-NOI Form must meet one of the following descriptions and be employed by the owner listed in Item 1.

- ☐ I certify that for a municipal agency, I am a principal executive officer or ranking elected official.
- ☐ I certify that for a state agency, I am a principal executive officer or ranking elected official.
- ☐ I certify that for a non-federal public agency, I am a principal executive officer or ranking elected official.
- ☒ I certify that for a federal agency, I am the chief executive officer of the agency, or I am the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
- ☐ I certify that I am a general partner for a partnership.
- ☐ I certify that I am the proprietor for a sole proprietorship.
- ☐ I certify that for a corporation, I am the President, Vice President, Secretary, or Treasurer of the corporation and in charge of a principal business function, or I perform similar policy or decision-making functions for the corporation.
- ☐ I certify that for a corporation, I am the Manager of one or more manufacturing, production, or operating facilities and am authorized to make management decisions which govern the operation of the regulated facility or facilities including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations. I can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements and authority to sign documents has been assigned or delegated to me in accordance with corporate procedures.
- ☐ I certify that for a trust, I am a trustee.
- ☐ I certify that for a limited liability company (LLC), I am the Manager or a Member authorized to make management decisions for the LLC and am in charge of a principal business function, or I perform similar policy or decision-making functions for the LLC.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: 

Date: 12/15/05

Printed Name & Title: LTC David C. Press, Lieutenant Colonel, U.S. Army District Engineer

Company/Organization Name: U.S. Army Corps of Engineers, Honolulu District

Phone No.: (808) 438-1069 Fax No.: (808) 438-8351

CWB-NOI Form C Checklist			
If any item (except for Item 17) is listed as "no," attach a sheet with the reason for its exclusion from the			
Item Number	Description	Is info.	
		yes	no
1.	Owner Information	X	
2.	Owner Type	X	
3.	General Contractor Information		X
4.	Project Information	X	
5.	Receiving State Water(s) Information	X	
6.	Quantity of Storm Water Discharge	X	
7.	Non-Storm Water Information	X	
8.	Location Map is attached	X	
9.	Flow Chart is attached	X	
10.	Existing or Pending Permits, Licenses, or Approvals		X
11.	NGPC Renewal	X	
12.	Automatic Coverage Under General Permit	X	
13.	Construction Site Characterization	X	
14.	Construction Site Area	X	
15.	Construction BMPs Plan		
	a. Project Site Map(s)	X	
	b. Construction Activity		X
	c. Quality of Discharge		X
	d. Potential Pollutant(s) and Control Measures		X
	e. Controls for Land Disturbances		X
	f. Erosion and Sediment Control Requirements (i.e., county-approved)		X
	g. Proposed Construction Schedule is attached		X
16.	Post-Construction Erosion Control Measures is attached	X	
17.	Additional Information		N/A
18.	Authorization of Representatives	X	
19.	Certification	X	
20.	Filing Fee (\$500.00) is attached	X	
21.	Number of copies with supporting documents submitted		
	a. One (1) copy for projects on Oahu with owner's original signature		N/A
	b. Two (2) copies for projects on islands other than Oahu (one with owner's	X	
22.	Submit one (1) copy to the Department of Land and Natural Resources,	X	
23.	Submit a list of all supporting documents (see General Guidelines for NOI	X	

*Items 3, 10 and 15b-g will be submitted by the General Contractor, once the contract has been awarded and a contractor is selected.

**STATE OF HAWAII
DEPARTMENT OF HEALTH
OFFICE OF SOLID WASTE MANAGEMENT**

Solid Waste Disclosure Form for Construction Sites

The following form shall be filled out for construction projects either identified as under 40 CFR 122.26(b)(14)(x) or produces (or will produce) dredged spoils. A response must be provided for each item. If an item is not relevant to the activity, indicate by "Not Applicable" (N/A), with a short comment.

This form will help the Department of Health, Office of Solid Waste Management (OSWM) to identify sources of construction/demolition and site clearing debris. The Department is responsible for the proper disposal of such solid waste. Violators of the regulations Title 11, Chapter 58, "Solid Waste Management Control," are subject to enforcement, corrective actions, and fines.

Completed forms shall be mailed to the Department of Health, Environmental Management Division, OSWM, P.O. Box 3378, Honolulu, Hawaii 96801-3378. Questions regarding this form should be directed to OSWM at 586-4240.

I. Site Information

- A. Address of site: _____
- B. Owner of site: _____
- Address of owner: _____
- Phone Number: _____
- C. Tax map key: _____
- Size of site: (in acres) _____
- D. Department of Public Work's grading permit no.: _____

II. Site Activity Information

- A. State the kinds of site clearing activities to be completed. State final use of site. Describe the general topography of site, i.e., whether level or sloped. _____
- _____
- _____
- _____
- _____

B. Describe structures on site (if none, indicate n/a)._____

If structures exist, are they to be demolished or
removed? ___yes ___no

C. Describe vegetation on site:_____

III. Contractor Information

A. General Contractor:_____

Contact person:_____Phone:_____

B. Site clearing contractor:_____

Contact person:_____Phone:_____

C. Hauling contractor:_____

Contact person:_____Phone:_____

D. State destination of:

1. Building demolition materials._____

2. Clear and grub materials._____

3. Dredged spoils._____

Name of person completing form:_____

Company:_____

Phone Number:_____



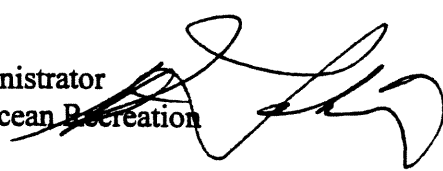
STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF BOATING AND OCEAN RECREATION
333 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813

October 17, 2000

BOR-E 0159.01

MEMORANDUM

TO: Dean Y. Uchida, Administrator
Land Division

FROM: Howard B. Gehring, Administrator
Division of Boating and Ocean Recreation 

SUBJECT: Conservation District Use Application (CDUA) MA-2988 for Light Draft
Navigation Improvements, Kahului, Maui

This is in reference to your memo of September 26, 2000, which informed us that the Board of Land and Natural Resources had approved (subject to specific conditions), our CDUA for the construction of the subject project. Thank you for processing and obtaining approval for our CDUA.

Enclosed is the signed acknowledged receipt and acceptance of the conditions contained in your memo. Should you have any questions, please call me at 587-1966, or contact Manuel Emiliano of our Boating Engineering Branch at 587-0122.

Enclosure

cc: with/enclosure

County of Maui, Department of Planning
James Hatashima, COE
✓ Sharon Ishikawa, COE *si 10/23/00*
Charles Penque, Maui District Manager
Eric Hill, DLNR Land Division
William Thompson



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT


REF.PB:EAH

SEP 26 2000

FILE NO.: MA-2988B

MEMORANDUM

TO: Admiral Howard Gehring, Administrator
Division of Boating and Ocean Recreation

FROM: Dean Y. Uchida, Administrator 

SUBJECT: Conservation District Use Application (CDUA) MA-2988 for Light-Draft Navigation Improvements at Kahului Harbor

I am pleased to inform you that on September 22, 2000, the Board of Land and Natural Resources (Board) approved your CDUA for the construction of light-draft navigation improvements at Kahului Harbor, subject to the following conditions:

1. The applicant shall comply with all applicable statutes, ordinances, rules, and regulations of the federal, state, and county governments, and applicable parts of Chapter 13-5, Hawaii Administrative Rules (HAR), including the standard conditions listed in 13-5-42, HAR;
2. The applicant shall comply with all applicable Department of Health administrative rules;
3. Before proceeding with any work authorized by the department or the board, the applicant shall submit four copies of the construction plans and specifications to the chairperson or his authorized representative for approval for consistency with the conditions of the permit and the declarations set forth in the permit application. Three of the copies will be returned to the applicant. Plan approval by the chairperson does not constitute approval required from other agencies;
4. Any work or construction to be done on the land shall be initiated within one year of the approval of such use, in accordance with construction plans that have been signed by the chairperson, and, unless otherwise authorized, shall be completed within three years of the approval of such use. The applicant shall notify the department in writing when construction activity is initiated and when it is completed;
5. All representations relative to mitigation set forth in the accepted environmental

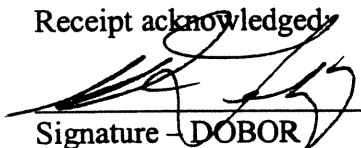
assessment or impact statement for the proposed use are incorporated as conditions of the permit;

6. In issuing the permit, the department and board have relied on the information and data which the applicant has provided in connection with the permit application. If, subsequent to the issuance of the permit such information and data prove to be false, incomplete, or inaccurate, this permit may be modified, suspended, or revoked, in whole or in part, and the department may, in addition, institute appropriate legal proceedings;
7. When provided or required, potable water supply and sanitation facilities shall have the approval of the department of health and the board of water supply;
8. Provisions for access, parking, drainage, fire protection, safety, signs, lighting, and changes on the landscape shall be provided;
9. Where any interference, nuisance, or harm maybe caused, or hazard established by the use, the applicant shall be required to take measures to minimize or eliminate the interference, nuisance, harm, or hazard;
10. Obstruction of public roads, trails, and pathways shall be minimized. If obstruction is unavoidable, the applicant shall provide roads, trails, or pathways acceptable to the department;
11. During construction, appropriate mitigation measures shall be implemented to minimize impacts to off-site roadways, utilities, and public facilities;
12. Cleared areas shall be revegetated within thirty days unless otherwise provided for in a plan on file with and approved by the department;
13. The applicant shall use silt curtains around dredged areas during dredging when practicable and feasible and around areas where any dredged material will be stored;
14. The applicant shall not conduct any blasting in Kahului Harbor;
15. The applicant shall obtain all necessary federal, state and county approvals for the disposal of dredged material;
16. Other terms and conditions as prescribed by the chairperson; and
17. Failure to comply with any of these conditions shall render this permit void.

Please acknowledge receipt of this letter and acceptance of the above conditions by signing in the space provided below and returning a copy to us within thirty (30) days.

Should you have any questions on this matter please contact our Planning Branch at (808) 587-0380.

Receipt acknowledged


Signature ~~DOBOR~~

9/28/00
Date

c: Maui Board Member
DOCARE
DOH
County of Maui, Department of Planning

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director



COUNTY OF MAUI
DEPARTMENT OF PLANNING

March 6, 2001

Mr. Howard B. Gehring, Acting Administrator
State of Hawaii
Department of Land and Natural Resources
Division of Boating and Ocean Recreation
333 Queen Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Gehring:

RE: Kahului Light Draft Navigation Improvements, Job H.C. 4171,
Special Management Area Use Permit and Shoreline Setback
Variance Time Extension, TMK: 3-7-01:21, 23, Kahului, Island of
Maui, Hawaii (SM1 970007) (SSV 970003)

Please be advised that the Maui Planning Department hereby grants approval of your February 22, 2001 request for the above-referenced time extension, subject to the following conditions:

1. That construction of the proposed project shall be initiated by May 1, 2002. Initiation of construction shall be determined as construction of offsite improvements, issuance of a foundation permit and initiation of construction of the foundation or issuance of a building permit and initiation of building construction, whichever occurs first. Failure to comply within this period will automatically terminate this Special Management Area Use Permit and Shoreline Setback Variance unless a time extension is requested no later than ninety (90) days prior to the expiration of said one (1) year period. The Maui Planning Director (Director) shall review and approve a time-extension request but may forward said request to the Maui Planning Commission (MPC) for its review and approval.

The permit holder or any aggrieved person may appeal to the MPC any action taken by the Director on the subject permit no later

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than ten (10) days from the date the Director's action is reported to the MPC.

2. That the construction of the project shall be completed within five (5) years after the date of its initiation. Failure to complete construction of this project will automatically terminate the Special Management Area Use Permit and Shoreline Setback Variance. A time extension shall be requested no later than ninety (90) days prior to the completion deadline. The Director shall review and approve a time-extension request but may forward said request to the MPC for its review and approval.

The permit holder or any aggrieved person may appeal to the MPC any action taken by the Director on the subject permit no later than ten (10) days from the date the Director's action is reported to the MPC.

3. That full compliance with all applicable governmental requirements shall be rendered.
4. That the applicant, its successors and permitted assigns shall exercise reasonable due care as to third parties with respect to all areas affected by subject Shoreline Setback Variance and Special Management Area Use Permit and shall defend, indemnify and hold the County of Maui harmless from and against any loss, liability, claim or demand arising out of this permit.
- CC 5. That appropriate measures shall be taken during construction to mitigate the short-term impacts of the project relative to soil erosion from wind and water, ambient noise levels and traffic disruptions. Precautions shall be taken to prevent eroded soils, construction debris and other contaminants from excessively entering the coastal waters.
- CC 6. That no construction, operation of equipment, storage of materials, excavation or deposition of soil or other materials shall occur seaward of the certified shoreline, dated December 8, 1992, unless approval is granted by the Department of Land and Natural Resources and the Army Corps of Engineers.

- CO
7. That final construction shall be in accordance with preliminary architectural and engineering plans submitted on March 13, 2000, of the Department's Report for the MPC's May 23, 2000 meeting.
- CO
8. That the applicant shall submit to the Department five (5) copies of a detailed report addressing its compliance with the conditions established with the subject Shoreline Setback Variance and Special Management Area Use Permit. A Final Compliance Report shall be submitted to the Department for review and approval within sixty (60) days of completion of construction.
9. That the subject Special Management Area Use Permit shall not be transferred without prior written approval in accordance with Section 12-202-17(d) of the Special Management Area Rules of the MPC. However, in the event that a contested case hearing preceded issuance of said Special Management Area Use Permit, a public hearing shall be held upon due published notice, including actual written notice to the last known addresses of parties to said contested case and their counsel.
- CC
10. That the applicant shall submit plans regarding the location of any construction-related structures, such as, but not limited to trailers, sheds, equipment and storage areas and fencing to be used during the construction phase and location of dredged material prior to stockpiling on the adjacent County property to the Department for its review and approval.
- CC
11. That the applicant shall develop the property in substantial compliance with the representations made to the MPC in obtaining the Special Management Area Use Permit. Failure to so develop the property may result in the revocation of the permit.

SPECIAL CONDITIONS

- NIC
12. That the Applicant shall provide the following road and street lighting improvements proposed to mitigate project-related traffic impacts, as recommended by "The Traffic Management Consultant" in their *Traffic Impact Analysis Report* attached as Exhibit 14 in the Department's Report prior to the opening of the new boat-launch facility:

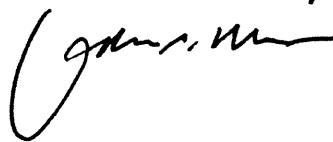
- NIC
- "B. 1. The boat-launch facility driveway will be widened to provide separate left-turn and right-turn lanes.
2. The inbound lane of the boat-launch facility driveway will be widened as necessary to accommodate the vehicle/boat trailer access.
3. The street lighting will be installed on Kahului Beach Road at the boat-launch facility driveway."
13. That the Applicant will work with the State Department of Transportation, Highways Division, to provide the following traffic improvements to Kahului Beach Road proposed to mitigate existing roadway deficiencies, as recommended by "The Traffic Management Consultant" in their Traffic Impact Analysis Report attached as Exhibit 14 in the Department's Report:
- "A. 1. Construct an exclusive left-turn lane on the southbound Kahului Beach Road within the existing grass median to provide for adequate deceleration length.
2. Construct a median-storage lane on the southbound Kahului Beach Road within the existing median to facilitate the left-turn movement from the boat-launch driveway.
3. Construct a right-turn taper on northbound Kahului Beach Road at the boat-launch facility driveway to facilitate the turning movements of large vehicle/boat trailers."
- CC 14. That the Applicant shall comply with the recommendations of the Board of Water Supply to conserve water and protect the water resources during construction and adopt construction-related Best Management Practices (BMP).

Further, the conditions of this Special Management Area Use Permit shall be enforced pursuant to Sections 12-202-23 and 12-202-25 of the Special Management Area Rules for the MPC.

Mr. Howard B. Gehring, Acting Administrator
March 6, 2001
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Thank you for your cooperation. If additional clarification is required, please contact Matt Niles, Staff Planner, of this office at 270-7735.

Very truly yours,



JOHN E. MIN
Planning Director

JEM:MCN:cmb

c: Clayton Yoshida, AICP, Deputy Planning Director
Matt Niles, Staff Planner
Julie Higa, Staff Planner
Charles Jencks, Dept. of Public Works and Waste Management
Floyd Miyazono, Dept. of Parks and Recreation
Tom Phillips, Police Chief
Robert Siarot, Highways Division, Dept. of Transportation
Esther Ueda, State Land Use Commission
Dean Uchida, Dept. of Land and Natural Resources, Land Division
Office of Planning, CZM Program
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Project File
CZM File
General File
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SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 DEFINITION

The Contractor is responsible for quality control and shall establish and maintain an effective quality control program in compliance with the Contract Clause titled "Inspection of Construction." The quality control program shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The program shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with section 01330 SUBMITTAL PROCEDURES:

SD-01 PreConstruction Submittals

Quality Control Plan; G.

1.4 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 90 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Technicians responsible for sampling and testing of concrete shall be certified by the American Concrete Institute (ACI) or the Concrete Technicians Association of Hawaii (CTAH). Proof of certification shall be included in the CQC Plan. Personnel qualifications may be furnished incrementally as the work progresses, but in no case, less than fourteen (14) calendar days before personnel are required on the job.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives

outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test.
- f. For all proposed QC materials testing laboratories, the Contractor shall submit a current Honolulu Engineer District (HED) or Materials Testing Center (MTC) letter of validation.
- g. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentataion.
- h. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- i. Reporting procedures, including proposed reporting formats.
- j. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted

for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer.

The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a construction person with a minimum of 5 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned as System Manager, and may have duties as project superintendent and Site Safety and Health Officer (SSHO) in addition to quality control. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirement for the alternate shall be the same as for the designated CQC Systems Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager. If it is subsequently determined by the Contracting Officer that the minimum contract CQC

requirements are not being met, the Contractor may be required to provide additional staff personnel to the CQC organization at no cost to the Government.

3.4.4 Additional Requirement

The CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors" within the past 5 years. This course is periodically offered at the General Contractors Association of Hawaii.

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 15950A, Heating, Ventilating and Air Conditioning (HVAC) Control Systems; Section 15951A, Direct Digital Control for HVAC; Section 15990A, Testing, Adjusting, and Balancing of HVAC Systems; or Section 15995A, Commissioning of HVAC Systems, are included in the contract, the submittals required by those sections shall be coordinated with Section 01330, Submittal Procedures, to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 7 days in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 7 days in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product that conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 3.7.2.1 Validation Requirements

Any laboratory used by the Contractor for testing aggregate, concrete, bituminous materials, soils, rock, and other construction materials must possess a current validation letter prior to performance of testing by that laboratory. Validation shall be obtained through the Corps of Engineers Materials Testing Center (MTC) in Vicksburg, MS. Validation may be initiated by completing an Inspection Request Form and questionnaire that are available directly from the MTC or from the MTC website, <http://www.wes.army.mil/SL/MTC/inspection.htm>.

The MTC also maintains a website listing validated laboratories at: <http://www.wes.army.mil/SL/MTC/ValStatesTbl.htm>.

3.7.2.2 Exception

The validation letters already obtained from HED in 2001 and 2002 will be considered acceptable proof of validation through its expiration date. Upon expiration, laboratories must be revalidated by the MTC, as required above. The validation status of laboratories in Hawaii may be found at: <http://www.poh.usace.army.mil/Construction/LabValidation/labvalidation.html>.

3.7.2.3 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.4 Capability Recheck

If the selected laboratory fails the capability check, the Contractor shall reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to a testing laboratory on the Island of Oahu, State of Hawaii, designated by the Contracting Officer. Coordination for each specific test, exact delivery location, and dates will be made through the Government field office.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. The QC Manager shall develop a punch list of items which do not conform to the contract documents. The Government will review the punch list and add to or correct the items listed. The QC Manager shall incorporate Government comments and provide a Pre-Final Punch List. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be prepared using government-provided software, QCS (see Section

01312), that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Unless otherwise directed by the Contracting Officer the original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has

been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

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SECTION 01525

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

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SECTION 01525

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2003) Safety and Health Requirements
Manual
http://www.hq.usace.army.mil/soh/hqusace_soh.htm

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 PreConstruction Submittals

Accident Prevention Plan (APP); G

Activity Hazard Analysis (AHA); G

SD-06 Test Reports

Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

Accident Reports

Monthly Exposure Reports

Regulatory Citations and Violations

1.3 DEFINITIONS

a. Associate Safety Professional (ASP). An individual who is currently certified as an ASP by the Board of Certified Safety Professionals.

b. Certified Construction Health & Safety Technician (CHST). An individual who is currently certified as a CHST by the Board of Certified Safety Professionals.

c. Certified Industrial Hygienist (CIH). An individual who is currently certified as a CIH by the American Board of Industrial Hygiene.

d. Certified Safety Professional (CSP). An individual who is currently certified as a CSP by the Board of Certified Safety Professionals.

e. Certified Safety Trained Supervisor (CSTS). An individual who is currently certified as an STS by the Board of Certified Safety Professionals.

f. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.

g. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.

h. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:

- (1) Death, regardless of the time between the injury and death, or the length of the illness;
- (2) Days away from work;
- (3) Restricted work;
- (4) Transfer to another job;
- (5) Medical treatment beyond first aid;
- (6) Loss of consciousness; or
- (7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

i. Site Safety and Health Officer (SSHO). The superintendent or other qualified or competent person who is responsible for the on-site safety and health required for the project.

j. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

1.4 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, work performed shall comply with USACE EM 385-1-1, and any applicable federal, state, and local, laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.5 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employee uses illegal drugs or consumes alcohol during work hours. Ensure there are no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine, or saliva specimens and test the injured and involved employees for the influence of drugs and alcohol. A copy of the test shall be made available to the Contracting Officer upon request.

1.6 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.6.1 Personnel Qualifications

1.6.1.1 Site Safety and Health Officer (SSHO)

Site Safety and Health Officer (SSHO) shall be provided at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall meet the following requirements:

Level 3:

- A minimum of 5 years safety work on similar projects.
- 30-hour OSHA construction safety class or equivalent within the last 5 years.
- An average of at least 24 hours of formal safety training each year for the past 5 years.
- Competent person training as needed.

1.6.2 Personnel Duties

1.6.2.1 Site Safety and Health Officer (SSHO)

- a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily report.
- b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
- c. Maintain applicable safety reference material on the job site.
- d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
- e. Implement and enforce accepted APPS and AHAs.
- f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.
- g. Ensure sub-contractor compliance with safety and health requirements.

Failure to perform the above duties may result in dismissal of the SSHO, and/or a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.6.3 Meetings

1.6.3.1 Safety Coordination Meeting

a. The Contractor will be informed, in writing, of the date of the safety coordination meeting. The purpose of the safety coordination meeting is for the Contractor and the Contracting Officer's representatives to become acquainted and explain the functions and operating procedures of their respective organizations and to reach mutual understanding relative to the administration of the overall project's Accident Prevention Plan (APP) before the initiation of work.

b. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the safety coordination meeting. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

c. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the meeting and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.

d. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the safety coordination meeting, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.

e. The functions of a safety coordination meeting may take place at the Post-Award Kickoff meeting for Design Build Contracts.

1.6.3.2 Weekly Safety Meetings

Conduct weekly safety meetings at the project site for all employees. The Contracting Officer will be informed of the meeting in advance and be allowed attendance. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily quality control report.

1.6.3.3 3-Phase Control Meetings

The appropriate AHA shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection. The analysis should be used during daily inspections to ensure the implementation and effectiveness of safety and health controls.

1.7 TRAINING

1.7.1 New Employee Indoctrination

New employees (prime and sub-contractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

1.7.2 Periodic Training

Provide Safety and Health Training in accordance with USACE EM 385-1-1 and the accepted APP. Ensure all required training has been accomplished for all onsite employees.

1.7.3 Training on Activity Hazard Analysis (AHA)

Prior to beginning a new feature of work, training will be provided to all affected employees to include a review of the AHA to be implemented.

1.8 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan". Where a paragraph or subparagraph element is not applicable to the work to be performed indicate "Not Applicable" next to the heading. Specific requirements for some of the APP elements are described below at paragraph EM 385-1-1 contents. The APP shall be job-specific and shall address any unusual in unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. The APP shall include an executed POD Form 248-R rev (1 Jun 98), Accident Prevention Program, Administrative Plan.

Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the safety coordination meeting for acceptance. Work cannot proceed without an accepted APP. The Contracting Officer reviews and comments on the Contractor's submitted APP and accepts it when it meets the requirements of the contract provisions.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSO and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment.

Copies of the accepted plan will be maintained at the office and at the job site. The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.8.1 EM 385-1-1 Contents

In addition to the requirements outlined in Appendix A of USACE EM 385-1-1, the following is required:

a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSS, CHSTs. The duties of each position shall be specified.

b. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

(2) Description of the on-site prevention program

c. Fall Protection and Prevention (FP&P) Plan. The plan shall be site specific and address all fall hazards in the work place and during different phases of construction. It shall address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 1.8 m (6 feet). A qualified person for fall protection shall prepare and sign the plan. The plan shall include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. The accepted Fall Protection and Prevention Plan shall be kept and maintained at the job site for the duration of the project. The Fall Protection and Prevention Plan shall be included in the Accident Prevention Plan (APP).

d. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, confined space entry, fall protection, crane operation, vehicle operator, forklift operators, personal protective equipment); list of requirements for periodic retraining/certification; outline

requirements for supervisory and employee safety meetings.

1.8.2 Plan Acceptance

The Contractor shall not commence physical work at the site until the plan has been accepted by the Contracting officer, or his authorized representative. In developing and implementing its Accident Prevention Plan, the Contractor is also responsible for reviewing Section 1 of the most current edition of U.S. Army Corps of Engineers Safety and Health Requirement Manual EM 385-1-1.

1.9 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be prepared using POD Form 184-R, rev 16 Oct 98. Submit the AHA for review at least 15 calendar days prior to the start of each feature of work. Format subsequent AHA as amendments to the APP. An AHA will be developed by the Contractor for every operation involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The analysis must identify and evaluate hazards and outline the proposed methods and techniques for the safe completion of each feature of work. At a minimum, define activity being performed, sequence of work, specific safety and health hazards anticipated, control measures (to include personal protective equipment) to eliminate or reduce each hazard to acceptable levels, equipment to be used, inspection requirements, training requirements for all involved, and the competent person in charge of that feature of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall protection methods used. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include requirements for safeguarding excavations. An activity requiring an AHA shall not proceed until the AHA has been accepted by the Contracting Officer's representative and a meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activity, including on-site Government representatives. The Contractor shall document meeting attendance at the preparatory, initial, and follow-up phases of quality control inspection. The AHA shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Activity hazard analyses shall be updated as necessary to provide an effective response to changing work conditions and activities. The on-site superintendent, site safety and health officer and competent persons used to develop the AHAs, including updates, shall sign and date the AHAs before they are implemented.

1.10 DISPLAY OF SAFETY INFORMATION

Within 1 calendar days after commencement of work, erect a safety bulletin board at the job site. The following information shall be displayed on the safety bulletin board in clear view of the on-site construction personnel, maintained current, and protected against the elements and unauthorized removal:

- a. Map denoting the route to the nearest emergency care facility.
- b. Emergency phone numbers.
- c. Copy of the most up-to-date APP.
- d. Current AHA(s).
- e. OSHA 300A Form.
- f. OSHA Safety and Health Protection-On-The-Job Poster.
- g. Confined space entry permit.

1.11 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.12 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.13 REPORTS

1.13.1 Accident Reports

- a. All injuries, illness, and property damage, regardless of severity or magnitude are reportable. Reports shall be prepared on POD Form 265R and shall be submitted to the Contracting Officer no later than the end of the business day on which the incident occurred.
- b. For recordable injuries and illnesses, and property damage accidents resulting in at least \$2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.

1.13.2 Accident Notification

Notify the Contracting Officer as soon as practical, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

1.13.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

1.13.4 Regulatory Citations and Violations

Contact the Contracting Officer immediately of any OSHA or other regulatory agency inspection or visit, and provide the Contracting Officer with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

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SECTION 01670

RECYCLED / RECOVERED MATERIALS

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SECTION 01670

RECYCLED / RECOVERED MATERIALS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247

Comprehensive Procurement Guideline for
Products Containing Recovered Materials

1.2 OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. EPA designated products specified in this contract comply with the stated policy and with the EPA guidelines. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4 EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5 EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

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SECTION 01780

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SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

As-Built Drawings.

Drawings showing final as-built conditions of the project. The final CADD as-built drawings shall consist of three sets of electronic CADD drawing files in the specified format, one set of original drawings, three sets of prints of the originals, and one set of the Government accepted working as-built drawings.

SD-03 Product Data

As-Built Record of Equipment and Materials.

Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

Warranty Management Plan.

One set of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

Warranty Tags.

Two record copies of the warranty tags showing the layout and design.

Final Clean-Up.

Two copies of the listing of completed final clean-up items.

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the

contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1.2.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file as-built drawings.

1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall maintain 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a daily basis and at least one set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. At the final inspection or upon beneficial occupancy of the facility by the user, whichever comes first. The Contractor shall provide one of the two sets of working as-built drawings to the COR for turnover with the facility. This set will serve as an advance/interim working set for the occupant of the completed facility; until such time that the final as-built drawings are furnished to them. Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked drawings and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement is reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. The working and final as-built drawings shall show, but shall not be limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

b. The location and dimensions of any changes within the building structure.

c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection,

installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built drawings.

h. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.

i. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

j. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.

- (1) Directions in the modification for posting descriptive changes shall be followed.
- (2) A Modification Circle shall be placed at the location of each deletion.
- (3) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.
- (4) For minor changes, a Modification Circle shall be placed by the area changed on the drawing (each location).
- (5) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.
- (6) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.
- (7) The Modification Circle size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

1.2.1.3 Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with Government accepted working as-built drawings, and adding such additional drawings as may be necessary. These working as-built marked drawings shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned by the Contractor to the Contracting Officer after final acceptance by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

1.2.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of microstation CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files. The Contractor will be furnished Microstation CADD files and pentable. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make required corrections, changes, additions, and deletions.

a. CADD colors shall be the "base" colors of red, green, and blue. Color code for changes shall be as follows:

- (1) Deletions (red) - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.
- (2) Additions (Green) - Added items shall be drawn in green with green lettering in notes and leaders.
- (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.

b. All changes to the contract drawing files shall be made on the level as the original item. There shall be no deletions of existing lines; existing lines shall be over struck in red. Additions shall be in green with line weights the same as the drawing.

c. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "as-built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

d. Within 10 days after Government acceptance of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final CADD as-built drawings for that phase of work and submit two sets of blue/black-line prints of these drawings for Government review. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days the Contractor shall revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 10 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of three sets of electronic files on compact disc, read-only memory (CD-ROM), one set of originals, three sets of prints and one set of

the Government annotated and accepted working as-built drawings. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final acceptance. Failure to submit final as-built drawing files or working as-built marked drawings as specified shall be cause for withholding any payment due the Contractor under this contract. Acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

1.2.1.5 Payment

No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of the Contractor.

1.2.2 As-Built Record of Equipment and Materials

The Contractor shall furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Two sets of final record of equipment and materials shall be submitted 10 days after final inspection. The designations shall be keyed to the related area depicted on the contract drawings. The record shall list the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used
-------------	--------------------------	---	-------------------------	---------------

1.2.3 Final Approved Shop Drawings

The Contractor shall furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.2.4 Real Property Equipment

The Contractor shall furnish a list of installed equipment furnished under this contract. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. A draft list shall be furnished at time of transfer. The final list shall be furnished 10 days after transfer of the completed facility.

1.3 WARRANTY MANAGEMENT

1.3.1 Warranty Management Plan

The Contractor shall develop a warranty management plan. At least 30 days

before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled, in accordance with the Contract Clause, WARRANTY OF CONSTRUCTION. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase shall be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Information contained in the warranty management plan shall include, but shall not be limited to, the following:

a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

c. A list for each warranted equipment, item, feature of construction or system indicating:

1. Name of item.
2. Model and serial numbers.
3. Location where installed.
4. Name and phone numbers of manufacturers or suppliers.
5. Names, addresses and telephone numbers of sources of spare parts.
6. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
7. Cross-reference to warranty certificates as applicable.
8. Starting point and duration of warranty period.
9. Summary of maintenance procedures required to continue the warranty in force.
10. Cross-reference to specific pertinent Operation and Maintenance manuals.
11. Organization, names and phone numbers of persons to call for warranty service.
12. Typical response time and repair time expected for various warranted equipment.

d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

e. Procedure and status of tagging of all equipment covered by

extended warranties.

f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.3.2 Performance Bond

The Contractor's Performance Bond shall remain in effect throughout the construction period, and during the life of any guaranty required under the Contract Performance Bond, Standard Form 25.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others. After completion of the construction warranty work, charges will be made to the remaining construction warranty funds of expenses which the Government incurred while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government, at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.3.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, shall be continuously available, and shall be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.3.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes

specified, the Government will perform the work and backcharge the construction warranty payment item established.

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

Code 3-Electrical

Street lights.

Code 2-Water (Exterior)

No water to facility.

Code 3-All other work not listed above.

1.3.5 Warranty Tags

At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Contracting Officer. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

- a. Type of product/material_____.
- b. Model number_____.
- c. Serial number_____.
- d. Contract number_____.
- e. Warranty period_____from_____to_____.
- f. Inspector's signature_____.
- g. Construction Contractor_____.
- Address_____.
- Telephone number_____.
- h. Warranty contact_____.
- Address_____.
- Telephone number_____.
- i. Warranty response time priority code_____.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

1.4 OPERATION AND MAINTENANCE MANUALS

Operation manuals and maintenance manuals shall be submitted as specified. Operation manuals and maintenance manuals provided in a common volume shall be clearly differentiated and shall be separately indexed.

1.5 FINAL CLEANING

Debris shall be removed from roofs, drainage systems, gutters, and downspouts. Paved areas shall be swept and landscaped areas shall be raked clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on the day of final inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

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SECTION 01900

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-- End of Section Table of Contents --

SECTION 01900

MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Inspection of Existing Conditions.

A written report with color photographs noting the condition of the existing facilities at the time of the inspection. One copy of the report including photographs shall be submitted to the Contracting Officer, prior to construction.

Dust Control

Method(s) of dust control.

Excavation/Trenching Clearance.

Prior to start of any excavation or trenching work, the Contractor shall obtain clearance, in writing, from the appropriate communications agency and base or area engineer. Copies of all correspondence shall be provided the Contracting Officer. Normal coordination time for obtaining the necessary permits is approximately fifteen (15) calendar days. The Contractor shall advise the Contracting Officer promptly when it appears that the normal coordination time will be exceeded.

Condition of Contractor's Operation or Storage Area.

The Contractor shall submit to the Contracting Officer photographs and/or videos depicting the condition of the Contractor's Operation or Storage Area.

SD-07 Certificates

Products Containing Recovered Materials.

The Contractor shall submit manufacturer's certification attesting that product meets or exceeds EPA's recovered material guidelines.

1.2 CONTRACTOR QUALITY CONTROL

To assure compliance with contract requirements, the Contractor shall

establish and maintain quality control for materials and work covered by all sections of the TECHNICAL REQUIREMENTS in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Records shall be maintained for all operations including sampling and testing.

1.3 AS-BUILT DRAWINGS

As-built drawings shall be in accordance with Section 01780 CLOSEOUT SUBMITTALS.

1.4 DUST CONTROL

Dust control shall be in accordance with Section 02220 DEMOLITION. Measures shall also be taken for dust control along haul routes and equipment parking areas.

1.5 PROTECTION

The Contractor shall take all necessary precautions to insure that no damages to private or public property will result from his operations. Any such damages shall be repaired or property replaced by the Contractor in accordance with the CONTRACT CLAUSES entitled "PERMITS AND RESPONSIBILITIES" and "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS", without delay, and at no cost to the Government.

1.5.1 Warning Signs and Barricades

The Contractor shall be responsible for posting warning signs or erecting temporary barricades to provide for safe conduct of work and protection of property.

1.5.2 Protection of Grassed and Landscaped Areas

The Contractor's vehicles shall be restricted to haul routes and work areas as indicated on the construction plans. Vehicles shall not be driven or parked on grassed and/or landscaped areas except when absolutely necessary for the performance of the work and approved in advance by the Contracting Officer. Grassed or landscaped areas damaged by the Contractor shall be restored to their original condition without delay and at no cost to the Government. Any areas cleared during construction shall be revegetated within 30 calendar days.

1.5.3 Protection of Trees and Plants

Where necessary, tree branches and plants interfering with the work may be temporarily tied back by the Contractor to permit accomplishment of the work in a convenient manner, so long as they will not be permanently damaged thereby. If this is not feasible, they may be pruned, subject to written approval by the Contracting Officer.

1.5.4 Right of Entry

The Contractor shall protect all private property adjoining the project site. Right of Entry to use County of Maui property for the Contractor Work and Storage Area, haul route, and temporary stockpile area for dredge spoils (see Drawings, sheet C-14) as a result of this project has been negotiated by the Government and the State of Hawaii. This Right of Entry is attached to the end of this section. The Contractor shall agree to and

abide by all restrictions contained in the Right of Entry. Construction costs associated with compliance to the Right of Entry by the State of Hawaii, the United States Army Corps of Engineers, or the Contractor and any subcontractor shall be borne by the Contractor.

The Right of Entry is annotated as follows: Responsibilities of the Contracting Officer are designated as "CO", responsibilities of the construction contractor are designated as "CC" and joint responsibilities are designated as "CO/CC".

1.6 RESTORATION WORK

Existing conditions or areas damaged or disturbed by the Contractor's operations shall be restored to their original condition, or near original condition as possible, to the satisfaction of the Contracting Officer.

1.7 REMOVAL AND DISPOSAL

Removal and disposal shall be in accordance with Section 02220 DEMOLITION. The Contractor shall salvage or recycle waste to the maximum extent practical as it relates to the capabilities of local industries. A record of the quantity of salvaged or recycled materials shall be maintained by the Contractor during the length of the project and submitted to the Contracting Officer at acceptance of the project. Quantities shall be recorded in the unit of measure of the industry. Reuse of materials on the site shall be considered a form of recycling. An example of such reuse would be the use of acceptable excavated materials as fill.

1.8 INTERFERENCE WITH GOVERNMENT OPERATIONS

The Contractor shall establish work procedures and methods to prevent interference with existing operations within or adjacent to the construction area. Free passage into adjoining or adjacent buildings not in the contract will not be permitted except as approved by the Contracting Officer. Procedures and methods shall also provide for safe conduct of work and protection of property which is to remain undisturbed.

1.8.1 Coordination

The Contractor shall coordinate all work with the Contracting Officer to minimize interruption and inconvenience to the Government. Scheduling and programming of work will be established during the pre-construction conference.

1.8.2 Utilities and Facilities

All utilities and facilities within the area, except as noted in paragraph 1.12 Working Directives, shall remain operable and shall not be affected by the Contractor's work, unless otherwise approved in writing in advance by the Contracting Officer.

1.9 CONTRACTOR'S OPERATIONS OR STORAGE AREA

At the request of the Contractor, an open operations or storage area will be made available as shown on the drawings. The Contractor shall be responsible for the security necessary for protection of his equipment and materials, and shall maintain the area free of debris. No rusty or unsightly materials shall be used for providing the secure measure and such measure shall be erected in a workmanlike manner. Before any construction

commences on establishing the operation/storage area, Contractor shall take photographs and/or videos of the site in order to establish the original conditions of the site. A duplicate set shall be made and submitted to the Government for its files. Upon completion and prior to the final acceptance of the contract work, the Contractor shall restore the area to its original condition.

1.10 INSPECTION

1.10.1 Final Inspection and Acceptance

The Contractor shall give the Fort Shafter Area Family Housing Office, through the Contracting Officer, a minimum of fourteen (14) calendar days advance notice prior to final inspection for acceptance by the Contracting Officer. All deficiencies found on final inspection shall be promptly and satisfactorily corrected by the Contractor upon notification by the Contracting Officer.

1.11 Working Directives

All work shall be performed between the hours of 0730 to 1600 HST, Monday through Friday. No work shall be accomplished on Saturdays, Sundays, and all federal holidays without written permission from the Contracting Officer. Such written permission shall be available at the job site at all times during construction.

A minimum of one-half the harbor entrance channel width and entire launch ramp facility (existing and new) shall be made accessible to the public to permit and exit from the harbor on Saturdays, Sundays, and all federal and State of Hawaii holidays except when the existing launch ramp is demolished and the new launch ramps are constructed. The contractor must complete construction of the new launch ramps within 120 calendar days from initiating demolition of the existing launch ramp.

1.12 USE OF PRODUCTS CONTAINING RECOVERED MATERIALS

Recovered materials are materials manufactured from waste material and byproducts that have been recycled or diverted from solid waste. The Contractor shall give preference to products containing recovered material when price, performance, and availability meet project requirements. A listing of products, including the recommended recovered material content, is provided by the Environmental Protection Agency at <http://www.epa.gov/cpg/products.htm>. Only those products having recovered material content equal to or greater than EPA guidelines shall be used to meet this requirement.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

RIGHT-OF -ENTRY-FOR -CONSTRUCTION

Kahului Light Draft Improvements Project

(Project or Activity)

Tracts 4,5,&6 on Exhibit "A"

(Tract number or other Property Identification)

We, the County of Maui (Owner), title holder to, or authorized occupant of the land described above, in consideration of the benefits to be derived from the implementation of the Kahului Light Draft harbor Channel and Turning Basin Dredging and New Breakwater Project to be accomplished under the authority of Section 107 of the River and harbor Act of 1960, as amended, by the State of Hawaii, Department of Land and Natural resources, Division of Boating and Ocean recreation (Sponsor) and the U.S. Army Corps of Engineers, hereby grants to the Sponsor, its employees, representatives, and assigns an irrevocable permit or right to enter upon the lands described above at any time within a twenty four (24) month period from the date of this instrument in order to perform construction work of any nature, and to perform any other work necessary and incident to Project implementation, together with the right to trim, cut, fell, and remove therefrom trees, underbrush, obstructions, and any other vegetation, structures, and obstacles within the limits of the right-of-way-, upon the following terms and conditions:

- CC 1. All tools, equipment, buildings, improvements, and other property taken upon or placed upon the land by the Sponsor shall remain the property of the Sponsor and may be removed by the Sponsor at anytime within a reasonable period after the expiration of this permit or right-of-entry.
- CC 2. The Sponsor shall have the right to patrol and police the lands described above during the period of this permit or right-of-entry.
- CC 3. If any action of the Sponsors employees, representatives, or assigns in the exercise of this right-of-entry results in damage to the real property, the Sponsor will, in its sole discretion either repair such damage or make an appropriate settlement with the Owner. In no event shall such repair or settlement exceed the fair market value of the fee interest of the real property at the time immediately preceding such damage. The provisions of this clause are without prejudice to any rights the Owner may have to make a claim under applicable laws for any other damages than those provided herein.
- CC 4. If, during the construction activities authorized by this right-of-entry, the Sponsor, its employees, representatives, or assigns, discover a cultural or other property eligible for listing on the National Register of Historic Places, or a species listed as threatened or endangered under the federal Endangered Species Act, the Sponsor will immediately advise the Owner of the presence and nature of such discovery.

Executed this 23 day of April ~~2003~~ 2004.

APPROVED AS TO FORM
AND LEGALITY


Edward S. Kushi, Jr.
Deputy Corporation Counsel
County of Maui

COUNTY OF MAUI

BY 

ALAN M. ARAKAWA
Its Mayor

RIGHT-OF-ENTRY-FOR CONSTRUCTION
(page 2 of 2)

SPONSOR:

Department of Land and Natural
Resources
State of Hawaii

By:

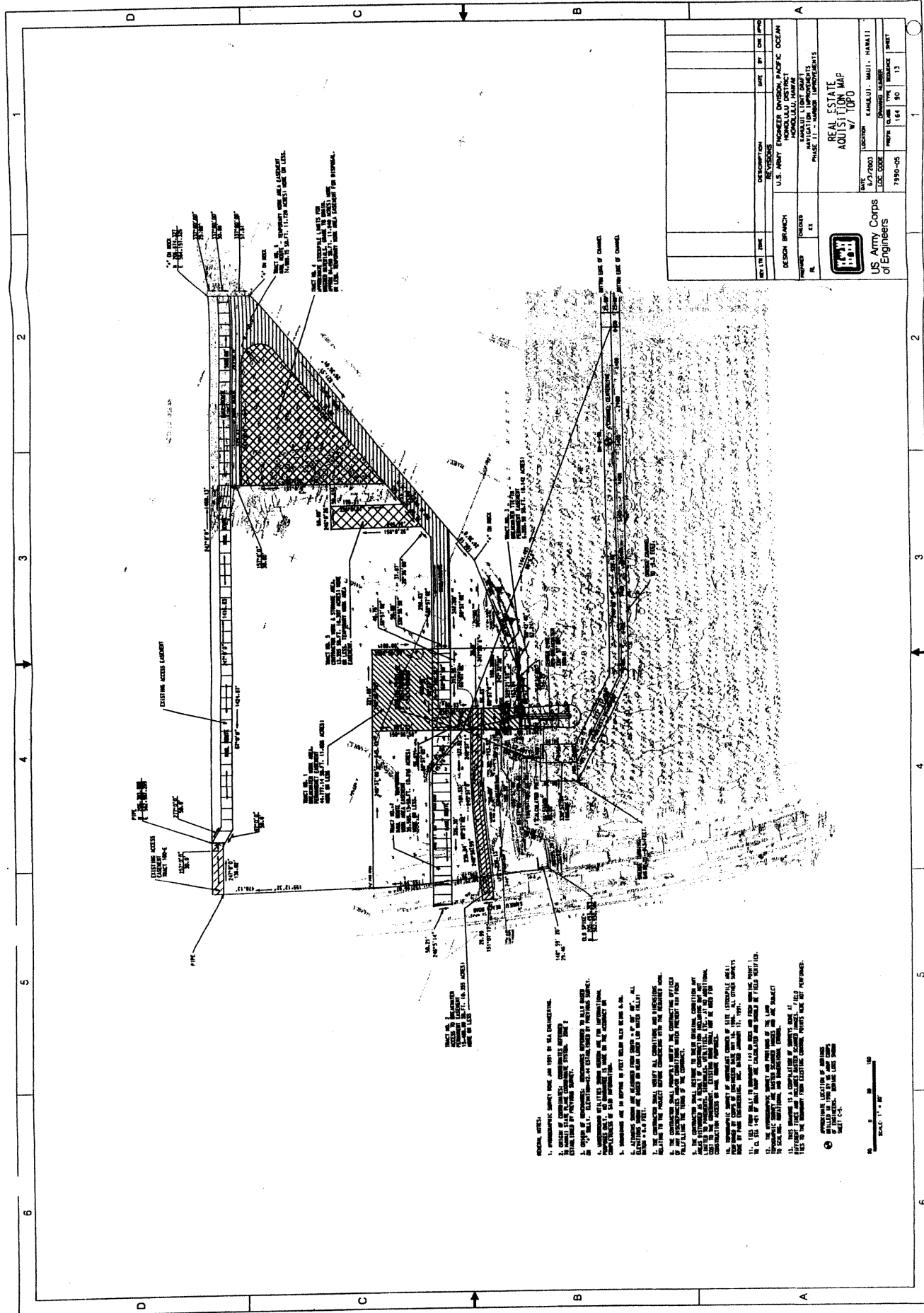

PETER T. YOUNG

(print name)

Its: Chairperson

APPROVED AS TO FORM:


Deputy Attorney General



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DIVISION 02 - SITE CONSTRUCTION

SECTION 02215

GEOTEXTILE

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 - 2.1.2 Seams
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PART 3 EXECUTION

- 3.1 INSTALLATION OF THE GEOTEXTILE

-- End of Section Table of Contents --

SECTION 02215

GEOTEXTILE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3786	(1997) Hydraulic Bursting Strength of Knitted Goods and Non-Woven Fabrics: Diaphragm Bursting
ASTM D 4439	(2002) Standard Terminology for Geosynthetics
ASTM D 4491	(1999a) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1997) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999a) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(2000) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 737	(1996) Air Permeability of Textile Fabrics

1.2 GENERAL

The work provided for herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for furnishings, hauling, and placing the geotextile, complete, as specified herein and shown on the contact drawings, and maintaining the geotextile until payment of the overlying material is completed and accepted.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be

submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Samples

Geotextile

If requested by the Contracting Officer, the Contractor shall provide to the Government geotextile samples for testing to determine compliance with any or all of the requirements in this specification. Sampling of geotextile shall be in accordance with ASTM D 4354. When samples are to be provided, they shall be submitted a minimum of 60 days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as, and shall be the full manufactured width of will be supplied for the contract the geotextile by at least 10 feet long, except that samples for seam strength may be a full width samples folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturers lot designation.

SD-07 Certificates

Mill Certificate or Affidavit

The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile.

The mill certificate or affidavit shall attest that the geotextile meets the chemical physical and manufacturing requirements stated in this specification.

1.4 SHIPMENT AND STORAGE

During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperature greater than 140 degrees Fahrenheit, mud, dirt, dust and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy-duty protective covering.

PART 2 PRODUCTS

2.1 GEOTEXTILE FILTER FABRIC

2.1.1 Geotextile

The geotextile shall be a woven or nonwoven pervious sheet of plastic yarn as defined by ASTM D 4439. The geotextile shall meet the physical requirements listed in Table No. 1 of the specifications. Fibers used in the manufacturer of geotextiles and the threads used in joining geotextiles, shall consist of long chain synthetic polymers, composed of at least 95% by weight polyolefins or polyesters. They shall be formed into a stable network such that the filament or yarns retain their dimensional stability relative to each other, including selvages and shall contain stabilizers and inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and heat exposure. Woven slit film geotextiles (i.e., geotextiles made from yarns of a flat, tape-like character) will not be allowed. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

2.1.2 Seams

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above from geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections not less than 36 feet wide. Seams shall be tested in accordance with method ASTM D 4632, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table 1) of the unaged geotextile in any principal direction.

TABLE NO 1 - PHYSICAL REQUIREMENTS FOR GEOTEXTILE FILTER FABRIC

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Acceptable Values</u>	
		<u>Woven</u>	<u>Non-Woven</u>
Grab Tensile Strength (unaged geotextile) +	ASTM D 4632	315 Pound minimum in any principal direction	205 pound minimum in any principal direction
Grab Elongation (unaged geotextile) +	ASTM D 4632	20 percent minimum in any principal direction	20 percent minimum in any principal direction
Puncture Strength (unaged geotextile) +	ASTM D 4833	115 pounds per square inch minimum	80 pounds per square inch minimum
Apparent Opening Size (AOS)	ASTM D 4751	No finer than The U.S. Standard Sieve No. 100 and no coarser than the U.S. Standard Sieve No. 50	No finer than the U.S. Standard Sieve No. 70 and no coarser than the U.S. Standard Sieve No. 30
Trapezoidal Tear Strength & Principal Direction	ASTM D 4533	115 pounds minimum in any principal direction	80 pounds minimum in any principal direction
Mullen Burst Strength	ASTM D 3786	510 pounds sq inch	255 pounds sq inch
Geotextile Permeability (kg)	ASTM D 4491	The permeability of the geotextile shall be greater than 0.10 cm per	The permeability of the geotextile shall be greater than 0.10 cm per

TABLE NO 1 - PHYSICAL REQUIREMENTS FOR GEOTEXTILE FILTER FABRIC

		second	second
Sewn Seam Strength	ASTM D 4632	270 pounds minimum	185 pounds minimum

+ Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.

++ All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

2.2 GEOTEXTILE FABRIC BAGS

2.2.1 Geotextile

The fabric bags shall be made of woven, high-strength water-permeable fabric, meeting the physical requirements listed in Table No. 2 of the specifications. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of nylon, propylene, ethylene, ester, amide, or vinylidene-chloride. Seams shall be folded and double stitched with thread of geotextile yarn. The seam strengths shall not be less than 90 percent of the required tensile strength (Table 2) in any principal direction. Each fabric bag shall be provided with a self-closing inlet valve to accommodate insertion of a concrete pumping hose.

TABLE NO. 2 - PHYSICAL REQUIREMENTS FOR GEOTEXTILE FILTER FABRIC BAGS

<u>Physical Property</u>	<u>Test Procedures</u>	<u>Acceptable Values ++</u>
Grab Tensile Strength at 12 inch/minute strain rate	ASTM D 4632	400 pound minimum in any principal direction
Grab Elongation	ASTM D 4632	20 percent minimum in any principal direction
Puncture Strength	ASTM D 4833	150 pounds per square inch minimum
Trapezoidal Tear Strength at 12 inch/minute Strain Rate	ASTM D 4533	200 pounds minimum in any principal direction
Mullen Burst Strength	ASTM D 3786	900 pounds per square inch
Apparent Opening Size	ASTM D 4751	No. 40 U.S. Standard Sieve
Permeability	ASTM D 4491	0.09 centimeter per second minimum
Porosity	ASTM D 737	105 cubic feet per minute minimum

TABLE NO. 2 - PHYSICAL REQUIREMENTS FOR GEOTEXTILE FILTER FABRIC BAGS

2.2.2 Concrete

Concrete for pumping into the fabric bags is specified under Section 03350, CAST-IN-PLACE TREMIE CONCRETE GROUT.

PART 3 EXECUTION

3.1 INSTALLATION OF THE GEOTEXTILE

The geotextile shall be placed in the manner and at the locations shown on the drawings. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The surface to receive the geotextile shall be prepared to a relatively smooth condition free of obstructions, depressions, debris and soft or low density pockets of material. Erosion features such as rills, gullies, etc., must be graded out of the surface before geotextile placement. The geotextile shall be placed with the long dimension parallel to the shoreline and laid smooth and free of tension, stress, folds, wrinkles or creases. The strips shall be placed to provide a minimum width of 36 inches of overlap for each joint. Temporary pinning of the textile to help hold it in place until the overlying material is placed shall be allowed. The temporary pins shall be removed as the overlying material is placed to relieve high tensile stress which may occur during placement of material on the geotextile. The placement procedure requires that the length of the geotextile be 15 percent greater than the slope length. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience. The geotextile shall be protected at all times during construction from contamination by surface runoff and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile. Any damage to the geotextile during its installation or during placement of overlying materials shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within one (1) day after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of overlying materials. This may be accomplished by limiting the height of drop to less than 1 foot, by placing a cushioning layer of sand or gravel on top of the geotextile before placing the material, or other methods deemed necessary. Before placement of overlying materials, the Contractor shall demonstrate that the placement technique will prevent damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

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SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6 (1990) Safety Requirements for Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 U.S. Army Corps of Engineers Safety and Health Requirement Manual

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property

which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

SD-11 Closeout Submittals

Receipts

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.5 DUST CONTROL

Prevent the spread of dust and avoid the creation of a nuisance in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to flooding, or pollution.

1.6 PROTECTION

1.6.1 Existing Work

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

1.6.2 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.6.3 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of the existing launch ramp, wooden dock, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.8 ENVIRONMENTAL PROTECTION

The work shall comply with the requirements of Section 01430 ENVIRONMENTAL PROTECTION.

1.9 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

Existing structures indicated shall be removed as called for in the plans.

3.1.2 Utilities and Related Equipment

Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer. If utility lines are encountered that are not shown on drawings, contact the Contracting Officer for further instructions.

3.1.3 Paving and Slabs

Remove sawcut concrete and asphaltic concrete paving and slabs as indicated to a depth of 2 to 4 inches below existing adjacent grade. Provide neat sawcuts at limits of pavement removal as indicated.

3.2 FILLING

Holes and other openings which can create hazardous conditions shall be filled in accordance with Section 02300a EARTHWORK.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award.

Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

Contractor shall salvage items and material to the maximum extent possible.

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

Historical items shall be removed in a manner to prevent damage. The following historical items shall be delivered to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

3.3.4 Unsalvageable Material

Existing wood, concrete, masonry, and other noncombustible material, except rock rip rap permitted to remain in place, shall be disposed of off government property. Re-use existing rock rip rap to construct new rock revetment.

3.4 CLEANUP

Debris and rubbish shall be removed from the project site and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

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SECTION 02300A

EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for pavements and railroads which shall be

comprised of stones less than 3 inches in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter. The Contracting Officer shall be notified of any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.2.4 Degree of Compaction

Degree of compaction required, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

1.2.5 Topsoil

Material suitable for topsoils obtained from offsite areas.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Earthwork.

Procedure and location for disposal of unused satisfactory material.
Blasting plan when blasting is permitted. Proposed source of borrow material.

Advance notice on construction for pavements.

SD-06 Test Reports

Testing.

Within 24 hours of conclusion of physical tests, 2 copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

1.4 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. These logs represent the best subsurface information available; however, subsurface variations exist between boring locations.

1.5 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.6 BLASTING

Blasting will not be permitted.

1.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 6 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be stockpiled in locations designated by the Contracting Officers Representative.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with

the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of. Unsatisfactory excavated material shall be disposed of. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas within the limits of the project site, selected by the Contractor or from approved private sources. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental

conditions.

3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section 02316a EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 6; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.8 EMBANKMENTS

3.8.1 Earth Embankments

Earth embankments other than dredged stockpile shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade

for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8.2 Dredged Stockpiles

Dredged stockpiles shall be constructed from dredged material, placed in relatively horizontal layers. Each layer of material shall be spread uniformly, sloped to drain towards the stockpile, and compacted with 4 passes of a vibratory compactor. Compaction shall be accomplished with vibratory compactors weighing at least 10 tons. Dredged material shall not be used as fill material for the construction of pavements. No testing is required for dredged stockpiles.

Silt curtains and other protection measures shall be placed around the stockpile to prevent soil, silt and suspended solids from entering the harbor.

3.9 SUBGRADE PREPARATION

3.9.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.9.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas, each layer of the embankment shall be compacted to at least 90 percent of laboratory maximum density.

3.9.2.1 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percentage laboratory maximum density for a depth of 12-inches. When more than one soil classification is present in the subgrade, the top 6 inches of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted.

3.10 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner

that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.11 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2 inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 6 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when excessively wet or dry.

Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

3.12 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.12.1 Fill and Backfill Material Gradation

One test per material or in-place source material used. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136, ASTM D 422, ASTM D 1140.

3.12.2 In-Place Densities

- a. One test per 2000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- b. One test per 4000 square feet, or fraction thereof, of each lift of embankment or backfill for roads.

3.12.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 for each 10 test using ASTM D 2922.

3.12.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.12.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.12.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.13 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, or pavement be placed on a muddy or spongy subgrade.

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SECTION 02316A

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Field Density Tests
Testing of Backfill Materials

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D

2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, and SP.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 1 inch. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

2.1.4 Rock

Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume, except that pavements shall not be considered as rock.

2.1.5 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 3 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.1.6 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

2.1.7 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1 inch sieve. The maximum allowable aggregate size shall be 1 inch, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.8 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 1 inch or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 1 inch in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Yellow:	Electric
---------	----------

2.3 Detection Wire For Non-Metalic Piping

Detection wire shall be insulated single strand, solid copper with a minimum diameter of 12 AWG.

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Rock excavation shall include removal and disposition of material defined as rock in paragraph MATERIALS. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be made vertical, and of such width as shown on drawings. Trench walls more than 4 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.2 Stockpiles

Stockpiles of satisfactory and unsatisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown.

3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.2.1.3 Bedding and Initial Backfill

Bedding shall be of the type and thickness shown. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the conduit. Care shall be taken to ensure thorough compaction of the fill under the haunches of the conduit.

3.2.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Roadways: Backfill shall be placed up to the elevation at which the requirements in Section 02300a EARTHWORK control. Water flooding or jetting methods of compaction will not be permitted.
- b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.3.1 Electrical Distribution System

Conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated.

3.3.2 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer.

3.4.2 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 1557. A minimum of one soil classification and

one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 4,000 square feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

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SECTION 02373

GEOTEXTILE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4354	(1999) Sampling of Geosynthetics for Testing
ASTM D 4355	(1999) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1999a) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1997) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999a) Determining Apparent Opening Size of a Geotextile
ASTM D 4759	(1988; R 1996) Determining the Specification Conformance of Geosynthetics
ASTM D 4833	(2000) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(2001) Identification, Storage, and Handling of Geosynthetic Rolls and Samples

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturing Quality Control Manual Sampling and Testing

A minimum of 30 days prior to scheduled use, manufacturer's quality control manual.

SD-07 Certificates

Geotextile

A minimum of 30 days prior to scheduled use, manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could damage other geosynthetic layers. The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturer.

1.3 DELIVERY, STORAGE AND HANDLING

Delivery, storage, and handling of geotextile shall be in accordance with ASTM D 4873.

1.3.1 Delivery

The Contracting Officer shall be notified a minimum of 24 hours prior to delivery and unloading of geotextile rolls. Rolls shall be packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, rolls shall be immediately rewrapped with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Each roll shall be labeled with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.3.2 Storage

Rolls of geotextile shall be protected from construction equipment, chemicals, sparks and flames, temperatures in excess of 160 degrees F, or any other environmental condition that may damage the physical properties of the geotextile. To protect geotextile from becoming saturated, rolls shall either be elevated off the ground or placed on a sacrificial sheet of plastic in an area where water will not accumulate.

1.3.3 Handling

Geotextile rolls shall be handled and unloaded with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 PRODUCTS

2.1 RAW MATERIALS

2.1.1 Geotextile

Geotextile shall be a woven or nonwoven pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. The use

of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be allowed. Stabilizers and/or inhibitors shall be added to the base polymer, as needed, to make the filaments resistant to deterioration by ultraviolet light, oxidation, and heat exposure. Regrind material, which consists of edge trimmings and other scraps that have never reached the consumer, may be used to produce the geotextile. Post-consumer recycled material shall not be used. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. Geotextiles shall meet the requirements specified in Table 1. Where applicable, Table 1 property values represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum average roll values.

TABLE 1
MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAB STRENGTH	LBS	160, 250	ASTM D 4632
PUNCTURE	LBS	55, 90	ASTM D 4833
TRAPEZOID TEAR	LBS	55, 90	ASTM D 4533
MAXIMUM APPARENT OPENING SIZE	U.S. SIEVE	60	ASTM D 4751
MINIMUM PERMITTIVITY	SEC -1	0.2	ASTM D 4491
ULTRAVIOLET DEGRADATION	PERCENT	50 AT 500 HRS	ASTM D 4355

2.2 MANUFACTURING QUALITY CONTROL SAMPLING AND TESTING

The Manufacturer shall be responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request. Manufacturing quality control sampling and testing shall be performed in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D 4354, Procedure A. Acceptance of geotextile shall be in accordance with ASTM D 4759. Tests not meeting the specified requirements shall result in the rejection of applicable rolls.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Subgrade Preparation

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile.

3.1.2 Placement

The Contractor shall notify the Contracting Officer a minimum of 24 hours prior to installation of geotextile. Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall also be free of tensile stresses, folds, and wrinkles. On slopes steeper than 10 horizontal on 1 vertical, the geotextile shall be laid with the machine direction of the fabric parallel to the slope direction.

3.2 SEAMS

3.2.1 Overlap Seams

Geotextile panels shall be continuously overlapped a minimum of 24 inches at all longitudinal and transverse joints. Where seams must be oriented across the slope, the upper panel shall be lapped over the lower panel. If approved, sewn seams may be used instead of overlapped seams.

3.3 PROTECTION

The geotextile shall be protected during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed. Adequate ballast (e.g. sand bags) shall be used to prevent uplift or flotation. The geotextile shall not be left uncovered for more than 14 days after installation.

3.4 REPAIRS

Torn or damaged geotextile shall be repaired. Clogged areas of geotextile shall be removed. Repairs shall be performed by placing a patch of the same type of geotextile over the damaged area. The patch shall extend a minimum of 24 inches beyond the edge of the damaged area. Patches shall be continuously fastened using approved methods. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Geotextile rolls which cannot be repaired shall be removed and replaced. Repairs shall be performed at no additional cost to the Government.

3.5 PENETRATIONS

Engineered penetrations of the geotextile shall be constructed by methods recommended by the geotextile manufacturer.

3.6 COVERING

Geotextile shall not be covered prior to inspection and approval by the Contracting Officer. Cover material shall be placed in a manner that prevents soil from entering the geotextile overlap zone, prevents tensile stress from being mobilized in the geotextile, and prevents wrinkles from folding over onto themselves. On side slopes, soil backfill shall be placed from the bottom of the slope upward. Cover soil shall not be dropped onto the geotextile from a height greater than 3 feet. No equipment shall be operated directly on top of the geotextile without approval of the Contracting Officer. Cover material type, compaction, and testing requirements are described in Section 02722a AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE.

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SECTION 02397

PLASTIC FENDER

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Manufacturer's Instructions

Submit six (6) sets of complete manufacturer's specifications, fender layout and drawings showing the hole location and size and type of hardware to be used to secure the fender to the concrete channel.

1.2 CERTIFICATION

a. Submit certified test reports and certificates of conformance or compliance furnished by the manufacturer's testing laboratory or independent testing agency attesting that each product or material furnished under this specification meets the requirements herein.

b. Certified test reports and certificates shall be furnished for:

- (1) Plastic Lumber
- (2) Fender Hardware - Bolts, anchor bolts, washers, and embedments.

PART 2 PRODUCTS

2.1 MATERIALS

Plastic Lumber shall be made of recycled mix plastic waste as manufactured by Trimax Plastic Lumber (Address 2076 Fifth Avenue, Ronkonkoma, New York, 11779, Telephone (516) 471-7777, Facsimile (516) 471-7862) or approved equal. Aloha Plastic Recycling Inc., P.O. Box 1429 Puunene, Maui, Hawaii 96784 (Telephone (808) 877-0822, Facsimile (808) 877-2503) distributes Trimax Plastic Lumber. The Plastic lumber shall have the following allowable design properties:

Property (all units are PSI)

Design Rupture Load (MOR) (Extreme Fiber Stress in Bending)	1470
Modulus of Elasticity	450,000
Compression Parallel to Grain	870
Compression Perpendicular to Grain	347

Property (all units are PSI)

Shear parallel to Grain (Horizontal Shear)	370
Tension Parallel to Grain	625
Abrasion Resistance	1000% - 2000%

Plastic lumber mechanical properties shall be as follows:

MECHANICAL PROPERTIES OF TRIMAX PLASTIC LUMBER

		<u>AVERAGE</u>	<u>STANDARD DEVIATION</u>
Moisture Condition	Not Applicable	Not	
Applicable			
Specific Gravity	0.75	05	
Modulus of Rupture	2960 psi-	45 psi	
(maximum fiber stress)	(1480 psi design)		
Modulus of Elasticity	450000 psi	.15 million psi	
Work to maximum Load			
(in pounds per cubic			
inch)	2.66	.60	
Compression Parallel			
to Grain	1740 psi	100 psi	
Compression Perpendicular			
to Grain	690 psi	60 psi	
Shear Parallel to Grain	740 psi	30 psi	
Impact Bending	7500 psi	800 psi	
Tension Parallel to Grain	1250 psi	110 psi	

PHYSICAL PROPERTIES

Moisture Content;	Negligible
Shrinkage/Swelling Due to Moisture:	Negligible
Coefficient of Thermal Expansion:	3.4X 10 ⁻⁵ in in/F
Density:	44 lb. - 50 lb. Per cubic foot
Friction	Friction Coefficient against rubber & leather soles

	<u>Rubber</u>		<u>Leather</u>	
	<u>Wet</u>	<u>Dry</u>	<u>Wet</u>	<u>Dry</u>
Lumber Surface (worn)	.92	.71	.28	.31
Lumber Surface (fresh)	.62	1.77	.22	.15
Simulated by grit blasting				

2.2 HARDWARE

All washers, nuts, anchor bolts, inserts, screws and other necessary hardware shall be stainless steel ASTM A 240 Type 316, allowable tensile

stress of 20,000 psi, and allowable shear stress of 1150 psi.

PART 3 EXECUTION

3.1 INSTALLATION

The plastic fender system shall be installed as shown on the plans with final adjustments (if any) required to fit fender snugly against the exterior face of the concrete loading docks. Adjustment shall be made by the Contractor at his expense and to the satisfaction of the Engineer. All fender adjustments shall be made prior to the final acceptance of the contract by the engineer.

All the surface bolts and nuts shall be recessed from the fender outside face. Plastic lumber shall be trimmed square and smooth on both ends to uniform lengths. Handle plastic lumber as per manufacturer's recommendations. All bolts to secure fender to concrete channel shall be cast-in-place. Field drilling of concrete will not be permitted.

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SECTION 02450

CLEATS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 148	(1984) Steel Castings, High Strength, for structural purposes
ASTM A 240	(1996a) Heat-Resisting Chromium and Chromium-Nickle Stainless Steel Plate, Sheet and Strip for Pressure Vessels

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop drawings and manufacturer's catalog data.

PART 2 PRODUCTS

2.1 MATERIALS

a. Cleats shall be made of cast steel conforming to ASTM Designation ASTM A 148 with ultimate strength of 80,000 psi. All new cleats shall hot-dip galvanized to 4 mills thick.

b. All fillets and chamfers shall have 1/2 inch radius, unless noted. Sand or grind faces to true plane prior to installing bollards.

c. Anchor bolts, nuts, and washers shall be stainless steel conforming to ASTM A 240 Type 316.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

3.1.1 New Ferrous Steel

Prepare surfaces prior to galvanizing in strict compliance with Steel

Structures Painting Council's Surface Preparation Standards as specified herein. SSPC-Vis-1-89, "Visual Standard for Abrasive Blast Cleaned Steel" shall be used as a guide to judge abrasive blasted surface areas. Areas of oil and extraneous materials on surfaces shall be cleaned with clean petroleum solvents and then blast cleaned according to SSPC SP6 "Commercial".

3.2 INSTALLATION

All cleats shall be installed as indicated on the plans. All bolts to anchor cleats shall be cast-in-place. Use cleat bolt template for accurate bolt placement into cast-in-place concrete. Field drilling of concrete will not be permitted.

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SECTION 02458A

PRESTRESSED CONCRETE PILING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 304R	(2000) Measuring, Mixing, Transporting, and Placing Concrete
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary
ACI SP-66	(1994) ACI Detailing Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1997a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 416/A 416M	(1999) Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A 421	(1998a) Uncoated Stress-Relieved Steel Wire for Prestressed Concrete
ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 934/A 934M	(1997) Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM C 33	(2001) Concrete Aggregates
ASTM C 150	(2000) Portland Cement
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 494	(1999) Chemical Admixtures for Concrete
ASTM C 666	(1997) Resistance of Concrete to Rapid Freezing and Thawing
ASTM D 934	(1999) Standard Practices for Identification of Crystalline Components

in Water Formed Deposits by X-Ray
Duffraction

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4 (1998) Structural Welding Code -
Reinforcing Steel

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI JR-119 (1972) Recommended Practice for Grouting
of Post-Tensioned Prestressed Concrete

PCI MNL-116 (1985) Manual for Quality Control for
Plants and Production of Precast and
Prestressed Concrete Products

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Drawings including shop and erection details and details of build-ups and embedded or attached lifting devices, prior to commencing the work or ordering materials. Drawings shall indicate pick-up and support points for piles. Reinforcing steel details shall conform to ACI SP-66.

SD-03 Product Data; G

Predrilling and Installation Equipment.

Descriptions of all predrilling and installation equipment to be employed in the work, prior to commencement of pile installations, including details of the methods to temporarily case the hole, install the pile, and fill the annular space between the pile and hole.

Contractors Qualifications

The Specialty Contractor shall submit a list of projects where piles were installed in similar subsurface conditions (hard coral, soft coral, basalt).

SD-06 Test Reports

Field Test and Inspections

Material Test Reports: Copies of material test reports and mix proportioning studies, within 24 hours after completion of tests.

1.3 QUALIFICATIONS

The work shall be performed by a firm specializing in the specified foundation system and having a minimum 2 years experience in constructing and installing the specified foundation system under similar subsurface and offshore conditions. The Contractor shall provide a list of projects, points of contact, phone numbers, and subsurface conditions where piles were installed under similar conditions.

1.4 SUBSURFACE DATA

Subsurface soil data logs are shown on the drawings and represent conditions at these locations. Conditions between borings may vary and will probably change as the basin is excavated.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Admixtures

Admixtures, if used in the concrete mixtures, shall all be compatible and shall be used at no additional cost to the Government. All admixtures shall be added at the plant. Super plasticizer or high range water reducer admixtures shall conform to ASTM C 494 to compensate for the increased water demand when microsilica is added to the concrete. The admixtures shall also be compatible with calcium nitrite solutions. Air-entraining admixture shall conform to ASTM C 260. Admixtures containing chlorides shall not be used.

Corrosion inhibitor admixture. All concrete shall contain a corrosion inhibiting admixture such as Master Builders organic-based Rheocrete 222 or W.R. Grace's calcium nitrite-based DCI, or approved equals. The water in solution shall be counted as mixing water for the purpose of determining the water to cement ratio of the concrete.

The organic-based Rheocrete 222 corrosion inhibiting admixture has no effect on rate of hardening and may be used in conjunction with other compatible admixtures, and in compliance with the manufacturer's recommendations for mixing, at a rate of 1.0 gallon per cubic yard of concrete. The calcium nitrite-based DCI admixture acts as an accelerator, and may be used in conjunction with other compatible admixtures added to the mix (at plant) immediately after the air-entrained and retarding admixtures have been introduced to the batch at a rate of 4.0 gallons per cubic yard of concrete.

2.1.2 Aggregates

2.1.2.1 General Requirements

Aggregates shall conform to ASTM C 33, except as specified otherwise herein. Aggregates shall be free from any substance which may be deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete. Coarse aggregate shall be 3/4-inch maximum nominal size.

2.1.2.2 Fine Aggregates

Fine aggregates from different sources of supply shall not be mixed or

stored in the same stock pile, or used alternately in the same concrete mix or the same structure without approval. The fineness MODULUS of fine aggregate shall be not less than 2.40 or greater than 3.0. For piles that will be exposed to freezing and thawing, fine and coarse aggregate subjected to five cycles of the sodium sulfate soundness test shall show a loss not greater than 10 percent. If the selected aggregates fail the soundness test, the Contractor may use the aggregate source, provided concrete specimens made with the aggregates to be used for the piles shall have a durability factor of not less than 80 based on 300 cycles of freezing and thawing when tested in accordance with ASTM C 666.

2.1.3 Anchorage

Anchorage and end fittings for post-tension assemblies shall conform to ACI 318/318R.

2.1.4 Cement

Cement shall conform to ASTM C 150. Type II cement shall be used. Cement shall contain less than 8 percent tricalcium aluminate (C3A).

2.1.5 Microsilica

Microsilica shall consist of 92 - 98 percent SiO₂ silicon dioxide, have a specific gravity of approximately 2.2 and a weight of 9 - 25 pounds per cubic feet (PCF), "Force 10,000S" by Grace Concrete Products or equal. Microsilica shall be in slurry form and shall be added at a rate of solid microsilica (excluding liquid weight) equal to 10% of the weight of cement.

2.1.6 Grout

Grout materials used in prestressed piles shall conform to the requirements specified herein for concrete mixes. Grout for post-tensioned ducts and bonds shall conform to PCI JR-119. Admixtures, when required for grout, shall have no injurious effects on steel or concrete. Calcium chloride shall not be used.

2.1.7 Prestressing Steel

Prestressing steel shall be seven-wire stress-relieved strand conforming to ASTM A 416/A 416M or stress-relieved wire conforming to ASTM A 421, Type WA. The minimum ultimate strength shall be 270,000 psi. Prestressing steel shall be free from grease, oil, wax, paint, soil, dirt, loose rust, kinks, bends, or other defects.

2.1.8 Reinforcing Steel

Non-prestressed reinforcing steel shall conform to ASTM A 615/A 615M, Grade 60. Welding of reinforcing steel shall be in accordance with AWS D1.4. All non-prestressed reinforcing steel, ties and spirals shall be epoxy coated in accordance with ASTM D 934. Damaged coatings shall be repaired in accordance with the epoxy manufacturer's repair recommendations.

2.1.9 Ties and Spirals

Steel for ties and spirals shall be epoxy coated and conform to ASTM A 82 and ASTM A 934/A 934M.

2.1.10 Water

Water for mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalies, salts, organic materials, or other substances that may be deleterious to concrete or steel. Mortar cubes made with nonpotable mixing water shall have 7-day and 28-day strengths equal to at least 90 percent of the strengths of similar specimens made with potable water.

2.2 MANUFACTURED UNITS - GENERAL REQUIREMENTS

Concrete piles shall be designed and fabricated by a precast concrete manufacturer certified under the PCI Plant Certification Program.

2.2.1 Pretensioned Piles

Pretensioned piles shall be cast as monolithic units of homogenous high-strength concrete from head to tip and stressed with high-tensile cold-drawn stress-relieved steel strands.

2.2.2 Seawater Exposure

For piles to be exposed to seawater, the concrete mix design and the concrete materials should be selected, placed, and cured in a manner that ensures production of extremely dense concrete free of shrinkage cracks and honeycomb with a minimum degree of permeability. The maximum permissible water-cement ratio (by weight) shall be 0.40 or 4.5 gallons of water per sack of cement. The cement shall be air entrained with a minimum of 4.5 percent and a maximum of 6 percent air entrainment, accomplished by use of an additive at the mixer and approved by the Contracting Officer.

2.2.3 Conveying

Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods that will not cause segregation or loss of ingredients in accordance with ACI 304R. It shall be deposited as nearly as practicable in its final position in the forms. At any point in conveying, the free vertical drop of the concrete shall not exceed 3 feet.

Chuting will be permitted only where the concrete is deposited into a hopper before it is placed in the forms. Conveying equipment shall be cleaned thoroughly before each run. Concrete shall be deposited as soon as practicable after the forms and the reinforcement have been inspected. Concrete that has segregated in conveying shall be removed.

2.3 FABRICATION OF PRETENSIONED PILES

2.3.1 Workmanship

Workmanship shall conform to PCI MNL-116. Pile pick-up points shall be the responsibility of the Contractor. Unless special lifting devices are attached for pick-up, pick-up points shall be plainly marked on all piles after removal of the forms, and all lifting shall be done at these points. Piles shall be lifted by a suitable bridge or sling attached to the pick-up points. Piling shall not be installed until the concrete attains a compressive strength of not less than 6,000 psi as indicated by breaking test cylinders.

2.3.2 Forms

Forms shall be of metal, shall be well braced and stiffened against

deformation, and shall be accurately constructed and watertight. Forms shall permit movement of the pile without damage during release of the prestressing force. Bottom of the form shall be within 1/4 inch of a true plane in a length of 50 feet. Inside forms or void tubes may be of treated fiberboard, plywood, or other material and/or method approved by the Contracting Officer. Void forms shall be anchored firmly so they will not move, float, or collapse during the placing of concrete. If a moving mandrel is used for forming the inner void, special precautions shall be taken to prevent fallout of inner surfaces, tensile cracks, and separation of concrete from strands.

2.3.3 Reinforcement and Embedments

Reinforcing steel, prestressing steel, and embedded items shall be accurately positioned in the forms and secured to prevent movement during concrete placement. In marine or other corrosive environments the minimum concrete cover shall be 3 inches.

2.3.4 Concrete Work

The concrete mix shall have an ultimate compressive strength of 6,000 psi at 28 days and a slump of 2 to 4 inches. Concrete shall not be deposited in the forms until the placement of reinforcement and anchorages has been inspected and approved by the Contracting Officer. Each pile shall be produced of dense concrete with smooth surfaces. Concrete shall be placed promptly after mixing is completed and shall be deposited close to its final position in the form. Vibrator heads shall be smaller than the minimum distance between steel for pretensioning. Dimensional tolerances shall conform to PCI MNL-116. The ends of all piles and the corners of square piles shall be chamfered. Side forms shall not be removed until concrete has attained 4800 psi compressive strength. Minimum concrete strength at time of installation shall be 6000 psi. Minimum strength at 28 days shall be 6000 psi.

2.3.5 Pretensioning

Anchorage for tensioning the prestressing steel shall be a type approved by the Contracting Officer. The tension to which the steel is to be pretensioned shall be measured by the elongation of the steel and verified by the jack pressure reading on a gauge. The gauge shall have been recalibrated by a calibration laboratory within 12 months of commencing work and every 6 months thereafter during the term of the contract. Means shall be provided for measuring the elongation of the steel to at least 1/8 inch. When the difference between the results of measurement and gauge reading is more than 5 percent, the cause of the discrepancy shall be corrected. The tensioning steel shall be given a uniform prestress prior to being brought to design prestress. The same initial prestress shall be induced in each unit when several units of prestressing steel in a pile are stretched simultaneously. Stress in prestressing reinforcement at nominal strength shall be 189,000 psi.

2.3.6 Detensioning

Releasing of prestressing force in pretensioned piles shall be performed in a manner that minimizes eccentricity of prestress. Tension in the strands shall be released from the anchorage gradually. In no case shall the stress be released after casting without approval by the Contracting Officer. The transfer of prestressing force shall be done when the concrete has reached a compressive strength of not less than 4800 psi.

2.3.7 Curing of Piles

Prior to the start of curing operations, the methods and details of curing shall be submitted for record and shall be approved by the Contracting Officers. All piles shall be cured in accordance with Section 4 of PCI MNL-116.

2.3.8 Build-Ups

Build-up (non-prestressed) of pile not allowed. Contractor may order precast-prestressed pile longer than shown on plan, then cut pile in field to meet pile elevation at cap and cap connection dimensions, meet minimum number of spirals at pile ends, and meet minimum strand development length.

2.3.9 Splices

Splicing of piles will not be permitted.

2.4 MANUFACTURING CONTROLS

2.4.1 Initial Sampling and Testing

Testing shall be performed by an acceptable, industry recognized and certified commercial testing laboratory or by an approved laboratory maintained by the manufacturer of the material.

2.4.1.1 Aggregates

Fine and coarse aggregates shall be tested for conformance with ASTM C 33.

2.4.1.2 Cement Test

Cement shall be tested at the mill or at the mixing plant for conformance with ASTM C 150.

2.4.1.3 Mix Proportions

Prior to commencing pile fabrication, the Contractor shall furnish a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete and lightweight concrete, proposed for use. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory. The statement shall also be accompanied by test results demonstrating compliance of aggregate and cement, as specified herein.

2.4.2 Changes in Proportions

If the test results of the laboratory cured cylinders at 28 days fall below the specified compressive strength, adjustments in the proportions, the water content, or both shall be made as necessary; if the test results of the field-cured specimens fall below the specified strength, changes in the casting, handling, or storage method and the moisture and curing procedures of such specimens shall be made as necessary to secure the specified

strength. All changes shall be submitted in writing to the Contracting Officer. The slump shall be as specified.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Predrilling

All piles will be installed in predrilled holes. The Contractor shall have all equipment necessary to drill a hole to a tip elevation as indicated on the contract drawings. The drill hole diameter shall provide a minimum 4-inch space (on all sides of the pile) between the largest pile dimension and the predrill hole. The Contractor shall use his expertise to drill the hole through variable subsurface materials consisting of sands and gravels, cobbles, boulders, tuff, limestone breccia, and lava basalt. The Contractor shall employ methods including use of temporary casing to prevent the sides of the hole from caving in or from surface materials from sloughing into the hole. Inspection method to ensure a clean hole at the correct elevation shall be submitted for Contracting Officer's approval.

3.1.2 Handling

Piles shall not be handled or moved in any manner that would result in cracking or permanent damage to the concrete. Piles shall not be installed until the concrete has attained a minimum strength of 6,000 psi. Piles may be installed with pile guides or leads.

3.1.3 Cutting of Piles

When necessary and approved by the Contracting Officer, cutting of piles shall be with pneumatic tools, sawing, or other approved methods. The use of explosives for cutting will not be permitted.

3.1.4 Protection of Piles

Care shall be taken to avoid damage to the piles in handling piles, and in placing the pile in the leads. Where pile or projecting reinforcement orientation is essential, special care shall be taken to maintain the orientation during installation. The top of the pile shall be squared to the longitudinal axis of the pile.

3.1.5 Tolerances in Installation

All piles shall be installed with a variation of not more than 0.125 inch per foot of pile length from the vertical for plumb piles. Top of pile shall be within 3 inches of the location indicated. Manipulation of piles to force them into position will not be permitted. All piles will be checked for alignment, prior to grouting the annulus. Pile alignment shall be maintained while grout cures for a minimum of 7 days.

3.1.6 Tremie Filling the Annulus

The annulus space between the pile and the predrill hole shall be filled with concrete using tremie methods. The concrete mix shall be self-leveling and pumpable with a maximum aggregate size 3/4 inch. The 28-day compressive strength of the concrete shall be at least 4000 psi. Water-reducing or retarding admixtures shall conform with ASTM C 494, Type A, B, D, F or G and produce a self-leveling concrete as it exits the tremie

pipe. An anti-washout admixture shall be used to reduce the potential for the cement to separate from the aggregate when exposed to seawater movement. Both the water-reducing/retarding admixture and the anti-washout admixture shall be compatible with each other. The Contractor shall account for barge movement when filling the annulus.

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SECTION 02482

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SECTION 02482

DREDGING

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 PreConstruction Submittals

Plant and Equipment Schedule

At the time of bidding, submit a schedule of all plant, equipment, auxiliaries and appurtenances on Form 1619R.

Operation Plan and Performance Schedule

Not later than thirty (30) days after receipt of Notice to Proceed, submit an operation plan and performance schedule for accomplishing the dredging work. No work shall commence until the operation plan and performance schedule have been submitted. The operation plan and performance schedule shall include a plan and schedule of work; method of dredging; method of protection of surrounding structures, equipment and vessels; method of sweeping and sounding; and the method of disposal of excavated materials, including details for containment or the dredged materials and handling of effluent waters.

Sweeping Plan, Method and Schedule

Not less than 30 days prior to any sweeping operations, submit a method and plan for sweeping.

Interference with Navigation

The Contractor shall submit a detailed method to avoid interference with existing scheduled harbor traffic operations to the Contracting Officer within thirty days after receipt of the Notice to Proceed.

SD-06 Test Reports

Dredging Records

Maintain records of all dredging work, sweeping operations and disposal of dredged materials. Also, maintain records of targets, ranges and markers.

1.3 EXISTING CONDITIONS

Explorations, including core borings and drive borings, indicate the character of materials to be removed, have been made by the Government, and the results are shown on the drawings. Material classified as Lava Basalt and Limestone Breccia and other forms of consolidated limestone material may not be removed by blasting. Whether a particular piece of mechanical equipment may remove the Lava Basalt and Limestone Breccia material depends upon the type and condition of the mechanical equipment used and the properties of the Lava Basalt and Limestone Breccia material. Materials classified as Lava Basalt and Limestone Breccia comprises most of the required excavation. Properties such as density, hardness and strength of these materials, as well as other foundation materials shown, will vary. These materials are not always found in hard, contiguous layers and may be individual and/or groups of cobbles and boulders scattered throughout the areas to be excavated or dredged. The vertical and horizontal extent of these materials may also vary.

It has been reported that the previous deepening of the turning basin encountered large boulders and that the boulders were difficult to remove. In addition, the limestone breccia encountered was demented and required the use of a metal spud to chisel into the limestone breccia. Removal of the cemented limestone breccia was also difficult.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Dredging shall consist of the excavation, removal and disposal of every type of material encountered within the lines, slopes, elevations and limits shown on the drawings.

The Contractor shall use appropriate containment devices around all dredged areas during dredging. These devices shall be inspected by the Contractor on a daily basis and damaged areas accordingly prior to restarting dredging. Temporary stoppage of work will be required if unacceptable water quality conditions are experienced due to the subject work.

3.2 SCHEDULE

The Contractor shall start and complete the work in accordance with the detailed schedule approved by the Contracting Officer.

3.3 INSPECTION

Inspect the work, keep records of work performed, and ensure that gauges, targets, ranges and other markers are in place and usable for the intended purpose. At the request of the Contracting Officer, the contractor shall provide transportation to and from the dredging for Government personnel.

3.4 PERMIT

The Contractor shall comply with all conditions and requirements of all Federal and State permits. The Contracting Officer will secure the permits for dredging and disposal of materials as indicated. Copies of all applicable permits will be maintained at the field office.

3.5 BLASTING

Blasting will not be permitted.

3.6 INTERFERENCE WITH NAVIGATION

The Contractor shall not interfere with State Department of Transportation Harbors Division or the Department of Land and Natural Resources Division of Boating and Ocean Recreation scheduled usage of channels, docks, and harbor areas. The scheduling of work shall be coordinated with the following individuals or their successors:

Mr. Scott Cunningham
District Manager, Harbors Maui
Department of Transportation - Harbors Division
103 Ala Luina Street
Kahului, Maui, Hawaii 96732
Phone: (808) 873-3350
FAX: (808) 873-3355

Ms. Carol She'
Maui District Manager
Department of Land and Natural Resources
Division of Boating and Ocean Recreation
2145 Wells Street, Suite 106
Wailuku, Maui, Hawaii 96793
Phone: (808) 243-5824
FAX: (808) 243-5829

The Contractor shall coordinate with the harbor master for the shifting or moving of dredges or the interruption of dredging operations to accommodate the movement of vessels and floating equipment, if necessary.

3.7 PLANT

The excavation and dredging equipment shall be of a type and size sufficient to meet the requirements of the work, and shall be kept at all times in safe and operational condition for efficient work. Maintain the plant, scows, coamings barges, pipelines, and associated equipment to meet the requirements of the work. Promptly repair all leaks or breaks along pipelines. Remove dredged materials placed due to leaks and breaks. Upon completion of the work, promptly remove plant, including all ranges, buoys, piles, and other markers or obstructions.

3.8 LIGHTS AND BUOYS

Each night, between sunset and sunrise and during periods of restricted visibility, provide lights for floating plants, pipelines, ranges and markers. Also, provide lights for buoys that could endanger or obstruct navigation. When night work is in progress, maintain lights from sunset to sunrise for the observation of dredging operations. Lighting shall conform to United States Coast Guard requirements for visibility and color.

The existing buoys shall be relocated temporarily prior to dredging. Upon completion of surveying and sweeping the buoys shall be relocated to their original position. Their position shall be verified by a licensed surveyor prior to removal and following relocation.

3.9 RANGES, GAUGES AND LINES

Furnish, set, and maintain ranges, buoys and markers needed to define the work and to facilitate inspection. Establish and maintain gauges in locations observable from all parts of the work so that the depth may be determined. Suspend dredging when the gauges or ranges cannot be seen or followed. Survey lines, points, and elevations necessary for setting the ranges, gauges, and buoys are shown on the drawings.

3.10 OVERDEPTH

Dredging shall follow, as closely as practicable, the lines indicated.

3.11 SIDE SLOPES

Dredging on side slopes shall follow, as closely as practicable, the lines indicated. A tolerance of one foot shall be permitted from the indicated or specified side slopes.

3.12 DISPOSAL OF DREDGED MATERIALS

Provide for safe transportation and disposal of dredged materials. Hauling of dredged materials over the new ramp is prohibited. Dredged materials shall be transported in watertight truck beds or other methods approved by the Contracting Officers Representative.

Return flow or runoff from dredged material deposited at the temporary dewatering stockpile area shall not enter State waters. Dredged material shall be disposed of by the Contractor at Contractors expense.

3.13 SWEEPING AND FINAL ACCEPTANCE

The Contractor shall sweep the dredged area. Sweeping operations shall be performed as specified below.

3.13.1 Surveying and Sweeping

As soon as practicable after the completion of all construction under this project, the Contractor, at his expense, shall retain a licensed surveyor registered in the State of Hawaii to provide a post-dredging survey by sounding at 25 foot stations. The licensed surveyor shall have a minimum of 3 years experience in hydrographic surveys. Sweeping shall be done first and the area reswept as necessary until the project depth is obtained. Sweeping operations shall be carried out from the reference lines, control points, and bench marks as indicated on the drawings. Ranges required by the Contractor to carry out the sweeping operations shall be set by the Contractor at his own expense. Sweeping shall be done in such a manner that sufficient overlap, not less than five (5) feet, on each succeeding sweep is attained to insure adequate coverage. The Contractor's method and plan for accomplishing the sweeping operation shall be included in the Contractor's sweeping Plan. Should any shoals, lumps, or other lack of contract depth be disclosed by the examination, the Contractor will be required to remove same by dragging the bottom or by excavating, but if the bottom is soft and the shoal areas are small and form no material obstruction to navigation, the removal of such shoal may be waived at the discretion of the Contracting Officer or his authorized representative. The Contracting Officer or his authorized representative will be notified when soundings are to be made, and will be permitted to

accompany the survey party. When the entire dredging area is found to be in a satisfactory condition, it will be accepted finally.

3.13.2 Final Acceptance

Final acceptance of the work and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud, or obvious error.

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SECTION 02510A

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300 (1992) Hypochlorites

AWWA B301 (1992) Liquid Chlorine

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 49 (1994) Hazardous Chemicals Data

NFPA 325-1 (1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids

NFPA 704 (1996) Identification of the Fire Hazards of Materials for Emergency Response

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation.

The manufacturer's recommendations for each material or procedure to be utilized.

Waste Water Disposal Method.

The method proposed for disposal of waste water from hydrostatic tests and disinfection, prior to performing hydrostatic tests.

Satisfactory Installation.

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the

manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-07 Certificates

Installation.

A statement signed by the manufacturer's field representative certifying that the Contractor's personnel are capable of properly installing the pipe on the project.

1.3 HANDLING

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

1.3.1 Miscellaneous Plastic Pipe and Fittings

Polyvinyl Chloride (PVC), pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.2 JOINTS

2.2.1 Plastic Pipe Jointing

2.2.1.1 PVC Pipe

Joints, fittings, and couplings shall be as specified for PVC pipe. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer.

2.3 MISCELLANEOUS ITEMS

2.3.1 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main

shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.3.2 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Transition Fittings

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

3.2 HYDROSTATIC TESTS

3.2.1 Pressure Test

After the pipe is laid, the joints completed and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

- a. Wet or unstable soil conditions in the trench.
- b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.
- c. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply

with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316a EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

$$L = 0.0001351ND(P \text{ raised to } 0.5 \text{ power})$$

L = Allowable leakage in gallons per hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be as specified. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- a. Pressure test and leakage test may be conducted concurrently.
- b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

3.3 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

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SECTION 02722A

AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- | | |
|--------------|---|
| AASHTO T 27 | (1999) Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates Nineteenth Edition; ASTM C 135-96a; Revised Per Interim Specification - Tests and Methods - 1999 |
| AASHTO T 90 | (2000) Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils Nineteenth Edition; Revised Per Interim Specifications - Test and Methods - 1999 |
| AASHTO T 96 | (1999) Standard Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine Nineteenth Edition: Revised Per Interim Specifications - Tests and Methods - 1999 |
| AASHTO T 176 | (2000) Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test Nineteenth Edition; Revised per Interim Specifications - Tests and Methods - 1999 |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|--|
| ASTM C 117 | (1995) Materials Finer than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing |
| ASTM C 127 | (1988) Specific Gravity and Absorption of Coarse Aggregate |
| ASTM C 128 | (1997) Specific Gravity and Absorption of Fine Aggregate |
| ASTM C 131 | (1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion |

	and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Aggregate Base Course

Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.2 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools

List of proposed equipment to be used in performance of construction work, including descriptive data.

Waybills and Delivery Tickets

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

SD-06 Test Reports

Sampling and testing Field Density Tests

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by a testing laboratory approved in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. The Contracting Officer may specify the time and location of the tests. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of the tests.

1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.4.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136.

Sieves shall conform to ASTM E 11. Particle-size analysis of the soils shall also be completed in conformance with ASTM D 422.

1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with ASTM D 1557.

1.4.2.4 Field Density Tests

Density shall be field measured in accordance with ASTM D 1556.

1.4.2.5 Wear Test

Wear tests shall be made on ABC course material in conformance with ASTM C 131.

1.4.3 Testing Frequency

1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

- a. Sieve Analysis.
- b. Liquid limit and plasticity index.
- c. Moisture-density relationship.
- d. Wear.

1.4.3.2 In Place Tests

Each of the following tests shall be performed on samples taken from the placed and compacted ABC. Samples shall be taken and tested at the rates indicated.

- a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.
- b. Sieve Analysis shall be performed for every 500 tons, or portion thereof, of material placed.
- c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

1.4.4 Approval of Material

The source of the material shall be selected 14 days prior to the time the material will be required in the work. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted ABC.

1.5 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 2 PRODUCTS

2.1 AGGREGATES

The ABC shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. ABC shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

2.1.1 Coarse Aggregate

Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

c. Crushed Recycled Concrete: Crushed recycled concrete shall consist of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. The recycled material shall be free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and shall be crushed and processed to meet the required gradations for coarse aggregate. Crushed recycled concrete shall meet all other applicable requirements specified below.

2.1.1.1 Aggregate Base Course

ABC coarse aggregate shall not show more than 40 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 25 percent. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in TABLE 1.

2.1.2 Fine Aggregate

Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

2.1.2.1 Aggregate Base Course

ABC fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 1 1/2 inches and shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
-----	-----	-----	-----
2 inch	100	----	----
1-1/2 inch	70-100	100	----
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-8	0-8	0-8

NOTE: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

2.1.4 Gradation For Filter Material

Filter material shall be of hard, tough, durable, lava rock.

If tested according to the designated methods, the aggregate shall meet the requirement below:

Test	Test Method	Requirement
Los Angeles Abrasion	AASHTO T 96 (Grading A)	10% Maximum @ 100 Rev. 40% Maximum @ 500 Rev.
Sand Equivalent	AASHTO T 176	35% Minimum
Plasticity Index	AASHTO T 90	6% Maximum
Grading	AASHTO T 27	Refer to Table 703-VI

TABLE 703-VI - GRADING REQUIREMENTS

Sieve Size	Percentage Passing by Weight
2	100

TABLE 703-VI - GRADING REQUIREMENTS

Sieve Size	Percentage Passing by Weight
1-1/2"	90 - 100
3/4	50 - 90
No. 4	15 - 50
No. 200	0 - 5

2.1.5 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the ABC is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from offsite sources.

3.3 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.4 PREPARATION OF UNDERLYING COURSE

Prior to constructing the ABC, the underlying course or subgrade shall be cleaned of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02300a EARTHWORK. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless

underlying courses containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the ABC. Stabilization shall be accomplished by mixing ABC into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the ABC is placed.

3.5 INSTALLATION

3.5.1 Mixing the Materials

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory ABC meeting all requirements of this specification.

3.5.2 Placing

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the ABC is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable ABC.

3.5.3 Grade Control

The finished and completed ABC shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required ABC thickness so that the finished ABC with the subsequent surface course will meet the designated grades.

3.5.4 Edges of Base Course

The ABC shall be placed so that the completed section will be a minimum of 5 feet wider, on all sides, than the next layer that will be placed above it. Additionally, approved fill material shall be placed along the outer edges of ABC in sufficient quantities to compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 2 foot width of this material to be rolled and compacted simultaneously with rolling and compacting of each layer of ABC. If this base course material is to be placed adjacent to another pavement section, then the layers for both of these sections shall be placed and compacted along this edge at the same time.

3.5.5 Compaction

Each layer of the ABC shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 5 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least 95 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory ABC. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.5.6 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 8 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the ABC course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the ABC course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.5.7 Finishing

The surface of the top layer of ABC shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of ABC is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

3.5.8 Smoothness

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Measurements shall be taken in

successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.6 TRAFFIC

Completed portions of the ABC course may be opened to limited traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The ABC shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any area of ABC that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of as directed. No additional payments will be made for materials that must be replaced.

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UNDERGROUND SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 32	(1996) Solder Metal
ASTM B 88	(1999) Seamless Copper Water Tube
ASTM D 1785	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2002) Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

ASME INTERNATIONAL (ASME)

ASME B16.18	(1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(1995; B16.22a1998) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)

FCCCHR-CCC	Manual of Cross-Connection Control
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check
Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2 (1993) Industrial Controls and Systems
Controllers, Contactors, and Overload
Relays Rated Not More Than 2,000 Volts AC
or 750 Volts DC

NEMA ICS 6 (1993) Industrial Control and Systems,
Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-51145 (Rev C) Flux, Soldering, Non-Electronic,
Paste and Liquid

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Field Tests

Performance test reports, in booklet form, showing all field tests performed to adjust each component; and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of control valves.

SD-07 Certificates

Sprinkler System

The material supplier's or equipment manufacturer's statement that the supplied material or equipment meets specified requirements. Each certificate shall be signed by an official authorized to certify in behalf of material supplier or product manufacturer and shall identify quantity and date or dates of shipment or delivery to which the certificates apply.

SD-10 Operation and Maintenance Data

Sprinkler System

Six copies of operation and six copies of maintenance manuals for the equipment furnished. One complete set prior to field testing and the remainder upon acceptance. Manuals shall be approved prior to the field training course. Operating manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operating manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout, simplified wiring and control diagrams of the system as installed, and system programming schedule.

1.3 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be protected from the weather; excessive humidity and temperature variation; direct sunlight (in the case of plastic or rubber materials); and dirt, dust, or other contaminants.

1.4 FIELD MEASUREMENTS

The Contractor shall verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT REQUIREMENTS

2.1.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer who has produced similar systems which have performed well for a minimum period of 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.1.2 Nameplates

Each item of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.2 PIPING MATERIALS

2.2.1 Copper Tubing and Associated Fittings

Tubing shall conform to requirements of ASTM B 88, Type K. Fittings shall conform to ASME B16.22 and ASME B16.18, solder joint. Solder shall conform to ASTM B 32 95-5 tin-antimony. Flux shall conform to CID A-A-51145, Type I.

2.2.2 Polyvinyl Chloride (PVC) Pipe, Fittings and Solvent Cement

2.2.2.1 PVC Pipe

Pipe shall conform to the requirements of ASTM D 1785, PVC 1120 Schedule

80; or ASTM D 2241, PVC 1120 SDR 21, Class 200.

2.2.2.2 PVC Fittings

Solvent welded socket type fittings shall conform to requirements of ASTM D 2466, Schedule 40. Threaded type fittings shall conform to requirements of ASTM D 2464, Schedule 80.

2.2.2.3 Solvent Cement

Solvent cement shall conform to the requirements of ASTM D 2564.

2.3 SPRINKLER HEADS

2.3.1 Rotary Pop-Up Sprinklers

Construction shall be high impact molded plastic with filter screen, reducible watering radius, and have adjustable radius capabilities.

2.4 VALVES

2.4.1 Gate Valves, Less than 3 Inches

Gate valves shall conform to the requirements of MSS SP-80, Type 1, Class 150, threaded ends.

2.4.2 Quick Coupling Valves

Quick coupling valves shall have brass parts and shall be two-piece unit consisting of a coupler water seal valve assembly and a removable upper body to allow spring and key track to be serviced without shutdown of main. Lids shall be lockable vinyl with spring for positive closure on key removal.

2.4.3 Remote Control Valves, Electrical

Remote control valves shall be solenoid actuated globe valves of 3/4 to 3 inch size, suitable for 24 volts, and designed to provide for shut-off in event of power failure. Valve shall be cast bronze or brass or plastic housing suitable for service at 150 psi operating pressure with external flow control adjustment for shut-off capability, external plug at diaphragm chamber to enable manual operation, filter in control chamber to prevent valve body clogging with debris, durable diaphragm, and accessibility to internal parts without removing valve from system.

2.4.4 Pressure Regulating Valve

Pressure regulating valve shall be self-cleaning, self-purging control system having an adjustable pressure setting. Valve shall close slowly and be free of chatter in each diaphragm position, have manual flow stem to adjust closing speed and internal flushing, and one inlet tapping capable of being installed as a straight pattern valve. Body shall be cast bronze or brass with removable brass seat serviceable from top without removing valve body from system. Valve shall operate at 150 psi working pressure and pilot range from 10 to 125 psi.

2.4.5 Backflow Preventers

Reduced pressure principle assemblies, double check valve assemblies,

atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCCHR-CCC.

2.5 ACCESSORIES AND APPURTENANCES

2.5.1 Valve Boxes

2.5.1.1 Valve Boxes

Valve boxes shall be cast iron, plastic lockable, or precast concrete for each gate valve, remote control valve. Box sizes shall be adjustable for valve used. Word "IRRIGATION" shall be cast on cover.

2.6 AUTOMATIC CONTROLLERS, ELECTRICAL

Controller shall conform to the requirements of NEMA ICS 2 with 120-volt single phase service, operating with indicated stations, and grounded chassis. Enclosure shall conform to NEMA ICS 6 Type 3R, with locking hinged cover, stainless steel, pedestal-mounted. Controller shall be programmed for various schedules by setting switches and dials equipped with the following features: A switch for each day of week for one schedule, allowing each station to be scheduled individually as to days of watering; a minute switch for each station with a positive increment range of 3 to 60 minutes, set time within one percent; a switch allowing selected schedules to be repeated after each completion of initial watering schedule and allowing each operation to be scheduled throughout a 24-hour day; a circuit breaker for surge protection; and circuit for a 9-volt rechargeable NiCad battery.

2.7 ELECTRICAL WORK

Wiring and rigid conduit for electrical power shall be in accordance with NFPA 70, and Section 16375A ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

2.8 WATER SUPPLY MAIN MATERIALS

Tapping sleeves, service cut off valves, and connections to water supply mains shall be in accordance with Section 02510a WATER DISTRIBUTION SYSTEM.

PART 3 EXECUTION

3.1 INSTALLATION

Sprinkler system shall be installed after site grading has been completed. Excavation, trenching, and backfilling for sprinkler system shall be in accordance with the applicable provisions of Section 02316a EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

3.1.1 Trenching

Trench around roots shall be hand excavated to pipe grade when roots of 2 inches diameter or greater are encountered. Trench width shall be 4 inches minimum or 1-1/2 times diameter of pipe, whichever is wider. Backfill shall be hand tamped over excavation. When rock is encountered, trench shall be excavated 4 inches deeper and backfilled with silty sand (SM) or well-graded sand (SW) to pipe grade. Trenches shall be kept free of obstructions and debris that would damage pipe. Subsoil shall not be mixed with topsoil. Existing concrete walks, drives and other obstacles shall be

bored at a depth conforming to bottom of adjacent trenches. Pipe sleeves for bored pipe shall be two pipe diameters larger than sprinkler pipe.

3.1.2 Piping System

3.1.2.1 Cover

Underground piping shall be installed to meet the minimum depth of backfill cover specified.

3.1.2.2 Clearances

Minimum horizontal clearances between lines shall be 4 inches for pipe 2 inches and less; 12 inches for 2-1/2 inches and larger. Minimum vertical clearances between lines shall be 1 inch.

3.1.2.3 Minimum Slope

Minimum slope shall be 6 inches per 100 feet in direction of drain valves.

3.1.3 Piping Installation

3.1.3.1 Polyvinyl Chloride (PVC) Pipe

a. Solvent-cemented joints shall conform to the requirements of ASTM D 2855.

b. Threaded joints shall be full cut with a maximum of three threads remaining exposed on pipe and nipples. Threaded joints shall be made tight without recourse to wicks or fillers, other than polytetrafluoroethylene thread tape.

c. Piping shall be joined to conform with requirements of ASTM D 2774 or ASTM D 2855, and pipe manufacturer's instructions. Pipe shall be installed in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Pipes shall be installed at temperatures over 40 degrees F.

3.1.4 Installation of Valves

3.1.4.1 Automatic Valves

Valve shall be set plumb in a valve box extending from grade to below valve body, with minimum of 4 inch cover measured from grade to top of valve. Automatic valves shall be installed beside sprinkler heads with a valve box.

3.1.5 Sprinklers and Quick Coupling Valves

Sprinklers and valves shall be installed plumb and level with terrain.

3.1.6 Backflow Preventers

Backflow preventer shall be installed in new connection to existing water distribution system, between connection and control valves.

3.1.7 Control Wire and Conduit

3.1.7.1 Wires

Low voltage wires may be buried beside pipe in same trench. Rigid conduit shall be provided where wires run under paving. Wires shall be number tagged at key locations along main to facilitate service. One control circuit shall be provided for each zone and a circuit to control sprinkler system.

3.1.7.2 Loops

A 12 inch loop of wire shall be provided at each valve where controls are connected.

3.1.7.3 Expansion and Contraction

Multiple tubes or wires shall be bundled and taped together at 20 foot intervals with 12 inch loop for expansion and contraction.

3.1.7.4 Splices

Electrical splices shall be waterproof.

3.1.8 Automatic Controller

Exact field location of controllers shall be determined before installation. Coordinate the electrical service to these locations. Install in accordance with manufacturer's recommendations and NFPA 70.

3.1.9 Backfill

3.1.9.1 Minimum Cover

Depth of cover shall be 12 inches for 2 inch pipe or smaller; and 12 inches for low-voltage wires. Remainder of trench or pipe cover shall be filled to within 3 inches of top with excavated soil, and compact soil with plate hand-held compactors to same density as undisturbed adjacent soil.

3.1.9.2 Restoration

Top 3 inches shall be filled with topsoil and compacted with same density as surrounding soil. Lawns and plants shall be restored in accordance with Sections 02921a SEEDING.

3.1.10 Adjustment

After grading, seeding, and rolling of planted areas, sprinkler heads shall be adjusted flush with finished grade. Adjustments shall be made by providing new nipples of proper length or by use of heads having an approved device, integral with head, which will permit adjustment in height of head without changing piping.

3.1.11 Disinfection

Sprinkler system fed from a potable water system shall be disinfected upstream of backflow preventer in accordance with Section 02510a WATER DISTRIBUTION SYSTEM.

3.1.12 Cleaning of Piping

Prior to the hydrostatic and operation tests, the interior of the pipe shall be flushed with clean water until pipe is free of all foreign materials. Flushing and cleaning out of system pipe, valves, and components shall not be considered completed until witnessed and accepted by Contracting Officer.

3.2 FIELD TESTS

All instruments, equipment, facilities, and labor required to conduct the tests shall be provided by Contractor.

3.2.1 Hydrostatic Pressure Test

Piping shall be tested hydrostatically before backfilling and proved tight at a hydrostatic pressure of 150 psi without pumping for a period of one hour with an allowable pressure drop of 5 psi. If hydrostatic pressure cannot be held for a minimum of 4 hours, Contractor shall make adjustments or replacements and the tests repeated until satisfactory results are achieved and accepted by the Contracting Officer.

3.2.2 Leakage Tests

Leakage tests for service main shall be in accordance with Section 02510a WATER DISTRIBUTION SYSTEM.

3.2.3 Operation Test

At conclusion of pressure test, sprinkler heads or emitter heads, quick coupling assemblies, and hose valves shall be installed and entire system tested for operation under normal operating pressure. Operation test consists of the system operating through at least one complete programmed cycle for all areas to be sprinkled.

3.3 CLEANUP

Upon completion of installation of system, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

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SECTION 02921A

SEEDING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602	(1995a) Agricultural Liming Materials
ASTM D 4972	(1995a) pH of Soils
ASTM D 5268	(1992; R 1996) Topsoil Used for Landscaping Purposes

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(1995) Federal Seed Act Regulations Part 201
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment
Surface Erosion Control Material
Chemical Treatment Material

Manufacturer's literature including physical characteristics, application and installation instructions for equipment, surface erosion control material and chemical treatment material.

Delivery

Delivery schedule.

Finished Grade and Topsoil

Finished grade status.

Quantity Check

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Seed Establishment Period

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

Maintenance Record

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

Application of Pesticide

Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

SD-04 Samples

Delivered Topsoil

Samples taken from several locations at the source.

Soil Amendments

A 10 pound sample.

SD-06 Test Reports

Soil Test

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-07 Certificates

Seed
Topsoil
pH Adjuster
Fertilizer
Organic Material
Mulch
Pesticide

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

a. Seed. Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.

b. Topsoil. Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.

c. pH Adjuster. Calcium carbonate equivalent and sieve analysis.

d. Fertilizer. Chemical analysis and composition percent.

e. Organic Material: Composition and source.

f. Mulch: Composition and source.

g. Pesticide. EPA registration number and registered uses.

1.3 SOURCE INSPECTION

The source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Delivered Topsoil

Prior to the delivery of any topsoil, its availability shall be verified in paragraph TOPSOIL. A soil test shall be provided for topsoil delivered to the site.

1.4.1.2 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.3 Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

1.4.2 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be

removed from the job site.

1.4.3 Storage

Materials shall be stored in designated areas. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials.

1.4.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.5 Time Limitation

Hydroseeding time limitation for holding seed in the slurry shall be a maximum 24 hours.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Seed Classification

State-certified seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS Seed Act and applicable state seed laws.

2.1.2 Permanent Seed Species and Mixtures

Seed mixtures shall be proportioned by weight as follows:

Seed Kind	Percentage of Weight of each Seed Kind In Mixture	Percentage of Weight of pure Live Seed of Each Kind	Percentage Pure Live In Mixture
Cynodon dactylon (Bermuda Grass) Hulled-Fancy- Fine Leaf	20	81	16.20
Cynodon dactylon (Bermuda Grass) Unhulled-Fancy Fine Leaf	60	82	49.20
Lolium perenne (perennial rye) or Lolium multiflorum (annual rye)	20	83	<u>16.60</u>
TOTAL PURE LIVE SEED IN MIXTURE			82.00

WEED SEED, NOT TO EXCEED 1 %

Seed Kind	Percentage of Weight of each Seed Kind In Mixture	Percentage of Weight of pure Live Seed of Each Kind	Percentage Pure Live In Mixture
OTHER THAN WEED AND PURE LIVE SEED, MAXIMUM			<u>17.40</u>
TOTAL			100.00%

2.1.3 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture.

2.1.4 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site as directed.

2.1.5 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300a EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the seed specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite shall not be used.

2.3.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, sulfur, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.

2.3.1.1 Limestone

Limestone material shall contain a minimum calcium carbonate equivalent of 80 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 55 percent shall pass through a No. 60 sieve. To raise soil pH, ground limestone shall be used.

2.3.1.2 Hydrated Lime

Hydrated lime shall contain a minimum calcium carbonate equivalent of 110 percent. Gradation: A minimum 100 percent shall pass through a No. 8 sieve and a minimum 97 percent shall pass through a No. 60 sieve.

2.3.2 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.3 Nitrogen Carrier Fertilizer

It shall be as recommended by the soil test. Nitrogen carrier fertilizer shall be commercial grade, free flowing, and uniform in composition.

2.3.4 Organic Material

Organic material shall consist of either decomposed wood derivatives or recycled compost.

2.3.4.1 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, yard trimmings, or other wood waste material that is free of stones, sticks, soil, and toxic substances harmful to plants, and is fully composted or stabilized with nitrogen.

2.3.4.2 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.4.1 Wood Cellulose Fiber

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

2.4.2 Paper Fiber

Paper fiber mulch shall be recycled news print that is shredded for the purpose of mulching seed.

2.5 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.6 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

2.7 SURFACE EROSION CONTROL MATERIAL

Surface erosion control material shall conform to the following:

2.7.1 Surface Erosion Control Blanket

Blanket shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers; covered on one side with either knitted straw blanket-like mat construction; covered with biodegradable plastic mesh; or interwoven biodegradable thread, plastic netting, or twisted kraft paper cord netting.

2.7.2 Surface Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

2.7.3 Surface Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 1.22 pounds per linear yard and 4 feet wide with mesh openings of approximately 1 inch square.

PART 3 EXECUTION

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

3.1.2 Soil Test

Delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class,

chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection on site shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the seed species specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade and Topsoil

The Contractor shall verify that finished grades are as indicated on drawings, and the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02300a EARTHWORK, prior to the commencement of the seeding operation.

3.2.2 Application of Soil Amendments

3.2.2.1 Applying pH Adjuster

The pH adjuster shall be applied as recommended by the soil test. The pH adjuster shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage operation.

3.2.2.2 Applying Fertilizer

The fertilizer shall be applied as recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation.

3.2.3 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inch depth. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inch depth by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster and fertilizer may be applied during this procedure.

3.2.4 Prepared Surface

3.2.4.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.

3.2.4.2 Lawn Area Debris

Debris and stones over a minimum 5/8 inch in any dimension shall be removed from the surface.

3.2.4.3 Field Area Debris

Debris and stones over a minimum 3 inch in any dimension shall be removed from the surface.

3.2.4.4 Protection

Areas with the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.1 Installing Seed

Seeding method shall be Hydroseeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved. Absorbent polymer powder shall be mixed with the dry seed at the rate recommended by the manufacturer.

3.3.2 Hydroseeding

Seed shall be mixed to ensure broadcast at the rate of 100 pounds per acre. Seed and fertilizer shall be added to water and thoroughly mixed to meet the rates specified. The time period for the seed to be held in the slurry shall be a maximum 24 hours. Wood cellulose fiber mulch and tackifier shall be added at the rates recommended by the manufacturer after the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry. Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.3 Mulching

3.3.3.1 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

3.3.4 Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.4 SURFACE EROSION CONTROL

3.4.1 Surface Erosion Control Material

Where indicated or as directed, surface erosion control material shall be

installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material or without deviation to finished grade.

3.5 QUANTITY CHECK

For materials provided in bags, the empty bags shall be retained for recording the amount used. For materials provided in bulk, the weight certificates shall be retained as a record of the amount used. The amount of material used shall be compared with the total area covered to determine the rate of application used. Differences between the quantity applied and the quantity specified shall be adjusted as directed.

3.6 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.6.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.6.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately. A pesticide plan shall be submitted.

3.7 RESTORATION AND CLEAN UP

3.7.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense.

3.7.2 Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.8 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.9 SEED ESTABLISHMENT PERIOD

3.9.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of seeding work under this contract and shall continue through the remaining life of the contract and end 3 months after the last day of the seeding operation required by this contract. Written calendar time period shall be furnished for the seed establishment period. When there is more than 1 seed establishment period, the boundaries of the seeded area covered for each period shall be described. The seed establishment period shall be coordinated with Sections 02930a EXTERIOR PLANTING. The seed establishment period shall be modified for inclement weather, shut down periods, or for separate completion dates of areas.

3.9.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high.

3.9.2.1 Lawn Area

A satisfactory stand of grass plants from the seeding operation for a lawn area shall be a minimum 20 grass plants per square foot. Bare spots shall be a maximum 9 inches square. The total bare spots shall be a maximum 2 percent of the total seeded area.

3.9.2.2 Field Area

A satisfactory stand of grass plants from the seeding operation for a field area shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

3.9.3 Maintenance During Establishment Period

Maintenance of the seeded areas shall include eradicating weeds, insects and diseases; protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

3.9.3.1 Mowing

Lawn Areas: Lawn areas shall be mowed to a minimum 3 inch height when the turf is a maximum 4 inches high. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

3.9.3.2 Post-Fertilization

The fertilizer shall be applied as recommended by the soil test. A maximum 1/2 pound per 1000 square feet of actual available nitrogen shall be provided to the grass plants. The application shall be timed prior to the advent of winter dormancy and shall be made without burning the installed grass plants.

3.9.3.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.3.4 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.9.3.5 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

-- End of Section --

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SECTION 02930A

EXTERIOR PLANTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees,
Shrubs and Other Woody Plant Maintenance

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

ANLA Z60.1 (1996) Nursery Stock

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4972 (1995a) pH of Soils

ASTM D 5268 (1992; R 1996) Topsoil Used for
Landscaping Purposes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Finished Grade, Topsoil and Underground Utilities

Finished grade status; location of underground utilities and facilities; and availability of topsoil from the stripping and stock piling operation.

SD-03 Product Data

Delivery

Delivery schedule.

Plant Establishment Period

Calendar time period for the plant establishment period.

Maintenance Record

Maintenance work performed, quantity of plant losses, and replacements; and diagnosis of unhealthy plant material.

Application of Pesticide

Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

SD-04 Samples

Delivered Topsoil

Samples taken from several locations at the source.

Soil Amendments

A 10 pound sample.

Mulch

A 10 pound sample.

SD-06 Test Reports

Soil Test

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-07 Certificates

Plant Material
Topsoil
Fertilizer
Organic Material
Organic Mulch
Pesticide

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

a. Plant Material: Classification, botanical name, common name, size, quantity by species, and location where grown.

b. Topsoil: Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.

- c. Fertilizer: Chemical analysis and composition percent.
- d. Organic Material: Composition and source.
- e. Organic Mulch: Composition, source, and treatment against fungi growth.
- f. Pesticide. EPA registration number and registered uses.

SD-10 Operation and Maintenance Data

Maintenance Instructions

Instruction for year-round care of installed plant material.

1.3 SOURCE INSPECTIONS

The nursery or source of plant material and the source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Plant Material Identification

Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the correct botanical plant name and size.

1.4.1.2 Protection During Delivery

Plant material shall be protected during delivery to prevent desiccation and damage to the branches, trunk, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport.

1.4.1.3 Delivered Topsoil

Prior to the delivery of any topsoil, the availability of topsoil shall be verified in paragraph TOPSOIL. A soil test shall be provided for delivered topsoil.

1.4.1.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.5 Pesticide Material

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

1.4.2 Inspection

Plant material shall be well shaped, vigorous and healthy with a healthy, well branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion. Plant material shall be checked for unauthorized substitution and to establish nursery grown status. Plant material showing desiccation, abrasion, sun-scald injury, disfigurement, or unauthorized substitution shall be rejected. The plant material shall exhibit typical form of branch to height ratio; and meet the caliper and height measurements specified. Plant material that measures less than specified, or has been poled, topped off or headed back, shall be rejected. Container-grown plant material shall show new fibrous roots and the root mass shall contain its shape when removed from the container. Plant material with broken or cracked balls; or broken containers shall be rejected. Bare-root plant material that is not dormant or is showing roots were pulled from the ground shall be rejected. Other materials shall be inspected for compliance with paragraph PRODUCTS. Open soil amendment containers or wet soil amendments shall be rejected. Topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material larger than 1-1/2 inch diameter shall be rejected. Topsoil that contains viable plant material and plant parts shall be rejected. Unacceptable material shall be removed from the job site.

1.4.3 Storage

1.4.3.1 Plant Material Storage

Plant material not installed on the day of arrival at the site shall be stored and protected in designated areas. Plant material shall not be stored longer than 30 days. Plant material shall be protected from direct exposure to wind and sun. Bare-root plant material shall be heeled-in. All plant material shall be kept in a moist condition by watering with a fine mist spray until installed.

1.4.3.2 Other Material Storage

Storage of other material shall be in designated areas. Soil amendments shall be stored in dry locations and away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with planting operation material.

1.4.4 Handling

Plant material shall not be injured in handling. Cracking or breaking the earth ball of plant material shall be avoided. Plant material shall not be handled by the trunk or stems. Materials shall not be dropped from vehicles.

1.4.5 Time Limitation

Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum 90 days. The time limitation between installing the plant material and placing the mulch shall be a maximum 24 hours.

1.5 WARRANTY

Furnished plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12 month period. A minimum 12

month calendar time period for the warranty of plant growth shall be provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with paragraph PLANT ESTABLISHMENT PERIOD, it shall be replaced once under this warranty.

PART 2 PRODUCTS

2.1 PLANT MATERIAL

2.1.1 Plant Material Classification

The plant material shall be nursery grown stock conforming to ANLA Z60.1 and shall be the species specified.

2.1.2 Plant Schedule

The plant schedule shall provide botanical names as included in one or more of the publications listed under "Nomenclature" in ANLA Z60.1.

2.1.3 Substitutions

Substitutions will not be permitted without written request and approval from the Contracting Officer.

2.1.4 Quality

Well shaped, well grown, vigorous plant material having healthy and well branched root systems in accordance with ANLA Z60.1 shall be provided. Plant material shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems, which may occur from the digging and preparation for shipment, method of shipment, or shipment. Plant quality is determined by the growing conditions; method of shipment to maintain health of the root system; and growth of the trunk and crown as follows.

2.1.5 Growing Conditions

Plant material shall be native to or well-suited to the growing conditions of the project site. Plant material shall be grown under climatic conditions similar to those at the project site.

2.1.6 Method of Shipment to Maintain Health of Root System

2.1.6.1 Balled Plant Material

Ball size and ratio shall be in accordance with ANLA Z60.1. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. Removal shall be done by hand digging or mechanical devices. The plant stem or trunk shall be centered in the ball. All roots shall be clean cut at the ball surface. Roots shall not be pulled from the ground. Before shipment the root ball shall be dipped in gels containing mycorrhizal fungi inoculum. Container shall be used to retain the ball unbroken. Container shall be rigid to hold ball shape and protect root mass during shipping.

2.1.6.2 Container-Grown (C) Plant Material

Container size shall be in accordance with ANLA Z60.1. Plant material

shall be grown in a container over a duration of time for new fibrous roots to have developed and for the root mass to retain its shape and hold together when removed from the container. The container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

2.1.7 Growth of Trunk and Crown

2.1.7.1 Deciduous Trees

A height to caliper relationship shall be provided in accordance with ANLA Z60.1. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

- a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.
- b. Specimen: The tree provided shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

2.1.7.2 Palms

Palms shall have the specified height as measured from the base of the trunk to the base of the fronds or foliage in accordance with ANLA Z60.1. The palm shall have straight trunk and healthy fronds.

2.1.7.3 Deciduous Shrubs

Deciduous shrubs shall have the height and number of primary stems recommended by ANLA Z60.1. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

2.1.8 Plant Material Size

Plant material shall be furnished in sizes indicated. Plant material larger in size than specified may be provided at no additional cost to the Government.

2.1.9 Plant Material Measurement

Plant material measurements shall be in accordance with ANLA Z60.1.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300a EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the plant material specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of fertilizer and organic material meeting the following requirements. Vermiculite is not recommended.

2.3.1 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade; free flowing, pellet or tablet form; uniform in composition; and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU).

Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.2 Organic Material

Organic material shall consist of either bonemeal, peat, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.2.1 Rotted Manure

Rotted manure shall be unleached horse, chicken, or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and shall be free of stones, sticks, and soil.

2.3.2.2 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. It shall be derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure is not recommended to be used as a mulch because it would encourage surface rooting of the plant material and weeds.

2.4.1 Organic Mulch

Organic mulch materials shall be native to the project site and consist of recycled mulch.

2.4.1.1 Recycled Mulch

Recycled mulch may include compost, tree trimmings, or pine needles with a gradation that passes through a 2-1/2 x 2-1/2 inch screen. It shall be cleaned of all sticks a minimum 1 inch in diameter and plastic materials a minimum 3 inch length. The material shall be treated to retard the growth of mold and fungi. Other recycled mulch may include peanut shells, pecan shells or coco bean shells.

2.4.1.2 Shredded Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

2.4.1.3 Wood Chips and Ground Bark

Locally chipped or ground material shall be treated to retard the growth of mold and fungi. Gradation: A maximum 2 inch wide by 4 inch long.

2.5 WOOD STAKING MATERIAL

Wood stakes shall be hardwood or fir; rough sawn; free from knots, rot, cross grain, or other defects that would impair their strength.

2.5.1 Bracing Stake

Wood bracing stakes shall be a minimum 2 x 2 inch square and a minimum 8 feet long with a point at one end. Stake shall be set without damaging rootball.

2.6 STAKING AND GUYING MATERIAL

2.6.1 Earth Anchor

Metal earth anchors shall be a minimum 1/2 inch diameter and a minimum 2 feet long.

2.6.2 Guying Material

Metal guying material shall be a minimum 12 gauge wire. Multi-strand cable shall be woven wire. Guying material tensile strength shall conform to the size of tree to be held firmly in place.

2.6.3 Turnbuckle

Metal turnbuckles shall be galvanized or cadmium-plated steel, and shall be a minimum 3 inches long with closed screw eyes on each end. Screw thread tensile strength shall conform to the size of tree to be held firmly in place.

2.7 RUBBER GUYING MATERIAL

Rubber chafing guards, consisting of recycled material, shall be used to protect tree trunks and branches when metal guying material is applied. The material shall be the same color throughout the project. Length shall be a minimum 1.5 times the circumference of the plant trunk at its base.

2.8 FLAG

Plastic flag material shall be used on guying material. It shall be a minimum 6 inches long. Tape color shall be consistent and visually complimentary to the entire project area. The tape color shall meet pedestrian visual safety requirements for day and night.

2.9 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

PART 3 EXECUTION

3.1 INSTALLING PLANT MATERIAL TIME AND CONDITIONS

3.1.1 Plant Material Conditions

Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval.

3.1.2 Tests

3.1.2.1 Soil Test

Delivered topsoil, excavated plant pit soil, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection onsite shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the plant material specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade, Topsoil and Underground Utilities

The Contractor shall verify that finished grades are as indicated on drawings, and that the placing of topsoil, the smooth grading, and the compaction requirements have been completed in accordance with Section 02300a EARTHWORK, prior to the commencement of the planting operation. The location of underground utilities and facilities in the area of the planting operation shall be verified. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

3.2.2 Protecting Existing Vegetation

When there are established lawns in the planting area, the turf shall be covered and/or protected during planting operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline to protect them during planting operations.

3.3 EXCAVATION

3.3.1 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to plant material location, type of plant and planting method shall be submitted for approval.

3.3.2 Plant Pits

Plant pits for ball and burlapped or container plant material shall be dug to a depth equal to the height of the root ball as measured from the base of the ball to the base of the plant trunk. Plant pits for bare-root plant material shall be dug to a depth equal to the height of the root system. Plant pits shall be dug a minimum 50 percent wider than the ball or root system to allow for root expansion. The pit shall be constructed with sides sloping towards the base as a cone, to encourage well aerated soil to be available to the root system for favorable root growth. Cylindrical pits with vertical sides shall not be used.

3.4 INSTALLATION

3.4.1 Setting Plant Material

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown.

3.4.2 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used.

3.4.3 Backfill Procedure

Prior to backfilling, all metal or synthetic products shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system. Additional requirements are as follows.

3.4.3.1 Bare-Root Plant Material

The root system shall be spread out and arranged in its natural position. Damaged roots shall be removed with a clean cut. The backfill soil mixture shall be carefully worked in amongst the roots and watered to form a soupy mixture. Air pockets shall be removed from around the root system, and root to soil contact shall be provided.

3.4.3.2 Container-Grown Plant Material

The plant material shall be carefully removed from containers that are not biodegradable. Prior to setting the plant in the pit, a maximum 1/4 depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. For plant material in biodegradable containers the container shall be split prior to setting the plant with container.

Backfill mixture shall be added to the plant pit in 6 inch layers with each layer tamped.

3.4.3.3 Earth Berm

An earth berm, consisting of backfill soil mixture, shall be formed with a minimum 4 inch height around the edge of the plant pit to aid in water retention and to provide soil for settling adjustments.

3.4.4 Watering

Plant pits and plant beds shall be watered immediately after backfilling, until completely saturated.

3.4.5 Staking and Guying

Staking will be required when trees are unstable or will not remain set due to their size, shape, or exposure to high wind velocity.

3.4.5.1 One Bracing Stake

Trees 4 to 6 feet high shall be firmly anchored in place with one bracing stake. The bracing stake shall be placed on the side of the tree facing the prevailing wind. The bracing stake shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly to the stake with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. A chafing guard shall be used when metal is the guying material.

3.4.5.2 Two Bracing Stakes

Trees from 6 to 8 feet height shall be firmly anchored in place with 2 bracing stakes placed on opposite sides. Bracing stakes shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly between the stakes with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Chafing guards shall be used when metal is the guying material.

3.4.5.3 Three Ground Stakes

Trees over a minimum 8 feet height and less than a maximum 6 inch caliper shall be held firmly in place with 3 bracing or ground stakes spaced equidistantly around the tree. Ground stakes shall be avoided in areas to be mowed. Stakes shall be driven into firm ground outside the earth berm. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. For trees over maximum 3 inch diameter at breast height, turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing guards shall be used when metal is the guying material.

3.4.6 Metal Anchors

Trees over a minimum 6 inch caliper shall be held firmly in place with metal earth anchors. Multi-strand cable guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing

guards shall be used.

3.4.7 Flags

A flag shall be securely fastened to each guy line equidistant between the tree and the metal anchor. The flag shall be visible to pedestrians.

3.5 FINISHING

3.5.1 Plant Material

Prior to placing mulch, the installed area shall be uniformly edged to provide a clear division line between the planted area and the adjacent turf area, shaped as indicated. The installed area shall be raked and smoothed while maintaining the earth berms.

3.5.2 Placing Mulch

The placement of mulch shall occur a maximum 48 hours after planting. Mulch, used to reduce soil water loss, regulate soil temperature and prevent weed growth, shall be spread to cover the installed area with a minimum 4 inch uniform thickness. Mulch shall be kept out of the crowns of shrubs, ground cover, and vines and shall be kept off buildings, sidewalks and other facilities.

3.5.3 Pruning

Pruning shall be accomplished by trained and experienced personnel. The pruning of trees and palms shall be in accordance with ANSI A300. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3.6 MAINTENANCE DURING PLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation and shall continue until the plant establishment period commences. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

3.7 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.7.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.7.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.8 RESTORATION AND CLEAN UP

3.8.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

3.8.2 Clean Up

Excess and waste material shall be removed from the installed area and shall be disposed offsite. Adjacent paved areas shall be cleared.

3.9 PLANT ESTABLISHMENT PERIOD

3.9.1 Commencement

The plant establishment period for maintaining exterior plantings in a healthy growing condition shall commence on the first day of exterior planting work under this contract and shall continue through the remaining life of the contract, not to exceed 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period, the boundaries of the planted area covered for each period shall be described. The plant establishment period shall be coordinated with Sections 02921a SEEDING. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for areas.

3.9.2 Maintenance During Establishment Period

Maintenance of plant material shall include straightening plant material, straightening stakes; tightening guying material; correcting girdling; supplementing mulch; pruning dead or broken branch tips; maintaining plant material labels; watering; eradicating weeds, insects and disease; post-fertilization; and removing and replacing unhealthy plants.

3.9.2.1 Watering Plant Material

The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of 1 inch absorbed water per week, delivered in the form of rain or augmented by watering. Run-off, puddling and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or existing plant material shall be prevented.

3.9.2.2 Weeding

Grass and weeds in the installed areas shall not be allowed to reach a maximum 3 inches height before being completely removed, including the root system.

3.9.2.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.2.4 Post-Fertilization

The plant material shall be topdressed at least once during the period of establishment with controlled release fertilizer, reference paragraph SOIL AMENDMENTS. Apply at the rate of 2 pounds per 100 square feet of plant pit or bed area. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy.

3.9.2.5 Plant Pit Settling

When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with paragraph INSTALLATION. The earth berm shall be maintained.

3.9.2.6 Maintenance Record

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

3.9.3 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

3.9.4 Replacement Plant Material

Unless otherwise directed, plant material shall be provided for replacement in accordance with paragraph PLANT MATERIAL. Replacement plant material shall be installed in accordance with paragraph INSTALLATION, and recommendations in paragraph PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with paragraph WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

3.9.5 Maintenance Instructions

Written instructions shall be furnished containing drawings and other

necessary information for year-round care of the installed plant material; including, when and where maintenance should occur, and the procedures for plant material replacement,.

-- End of Section --

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SECTION 02935A

EXTERIOR PLANT MATERIAL MAINTENANCE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees,
Shrubs and Other Woody Plant Maintenance

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4972 (1995a) pH of Soils

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan and Schedule
Delivery Schedule

Contractor's work plan and schedules.

Maintenance Record

Contractor's record of each site visit.

Application of Pesticide

Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

1.3 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.3.1 Delivery Schedule

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.3.2 Delivery of Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

1.3.3 Storage

Materials shall be stored in designated areas. Lime and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials.

1.3.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

PART 2 PRODUCTS

2.1 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite shall not be used.

2.1.1 Fertilizer

Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, shall be as recommended by the soil test and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulfur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.1.2 Organic Material

Organic material shall consist of bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.1.2.1 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. It shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds.

2.1.2.2 Recycled Compost

Recycled compost shall be well decomposed, stable, weed free organic matter

source. Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

2.2 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure shall not be used.

2.2.1 Organic Mulch

Organic mulch materials shall be native to the project site and consist of recycled mulch, shredded bark, wood chips, or ground bark for use when remulching trees, shrubs, and ground covers.

2.2.1.1 Recycled Mulch

Recycled mulch may include compost, tree trimmings, or pine needles with a gradation that passes through a 2-1/2 x 2-1/2 inch screen. It shall be cleaned of all sticks a minimum 1 inch in diameter and plastic materials a minimum 3 inch length. The material shall be treated to retard the growth of mold and fungi. Other recycled mulch may include peanut shells, pecan shells or coco bean shells.

2.2.1.2 Shredded Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

2.2.1.3 Wood Chips and Ground Bark

Locally chipped or ground material shall be treated to retard the growth of mold and fungi. Gradation: A maximum 2 inch wide by 4 inch long.

2.3 PESTICIDE

Pesticide shall be an insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

2.4 HERBICIDE

Herbicide shall be EPA registered and approved; furnished for preemergence and postemergence application for weed control. Record keeping format shall be submitted to Contracting Officer for approval.

PART 3 EXECUTION

3.1 SOIL TESTS

Contractor shall perform soil tests in accordance with ASTM D 4972.

3.2 SITE PREPARATION

3.2.1 Applying Fertilizer

Apply fertilizer at rate as recommended by the soil test.

3.3 MULCHING

Mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

3.4 WATERING

Water to supplement rainfall shall be applied at a rate sufficient to ensure plant growth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.5 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.5.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control.

3.5.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended to prevent the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately. A pesticide plan shall be submitted.

3.6 GENERAL MAINTENANCE REQUIREMENTS

3.6.1 Fertilization

Fertilizer shall be applied at rate as recommended by the soil test. Application shall be timed prior to the advent of winter dormancy and performed without burning plants.

3.6.2 Pesticide Treatment

Pesticide treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.6.3 Irrigation Maintenance

The Contractor shall service and repair controller, valves, couplers, sprinklers, sprinkler heads and piping. Sprinkler heads shall direct water away from building. The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone; the amount of water required shall be the equivalent of 1 inch absorbed water per week. Amount of irrigation watering shall take amounts of rain into account.

3.6.4 Maintenance Record

A record of each site visit shall be furnished, describing:

- a. Maintenance work performed.
- b. Areas repaired or reinstalled.
- c. Diagnosis for unsatisfactory stand of grass.
- d. Diagnosis for unsatisfactory stand of plant material in planting bed.
- e. Condition of trees.
- f. Condition of shrubs.
- g. Quantity and diagnosis of plant loss.
- h. Irrigation of system.

3.7 GRASS PLANT QUALITY

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high. The living grass area shall be maintained to be uniform in color and leaf texture; and free from weeds and other undesirable growth. The living grass area shall be relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 1 inch in diameter, woody plant roots, and other materials detrimental to a healthy stand of grass plants. Broadleaf weeds and patches of foreign grasses shall be a maximum 2 percent of the total area.

3.7.1 Lawn Area

A satisfactory stand of grass plants for a lawn area shall be a minimum 20 grass plants per square foot. Bare spots shall be a maximum 9 inches square. The total bare spots shall be a maximum 2 percent of the total area.

3.8 LAWN AREAS MAINTENANCE

3.8.1 Mowing

Lawn and field areas shall be mowed throughout the growing season to meet the requirements of paragraph GRASS PLANT QUALITY. Cutting height shall be adjusted according to type of grass. Frequency of mowing shall be adjusted so that no more than 1/4 of leaf length is removed during a cutting.

3.8.1.1 Lawn Areas

Lawn areas shall be mowed to a minimum 3 inch height when the turf is a maximum 4 inches high. Remove clippings when the amount cut prevents sunlight from reaching the ground surface.

3.8.2 Turf Trimming

Turf adjoining paved areas, planting beds and trees shall be kept neatly trimmed at all times, essentially after each mowing.

3.8.3 Herbicide Weed Control

Two or more applications of a pre-emergent herbicide and of a post-emergent herbicide shall be performed to meet the requirements of paragraph GRASS PLANT QUALITY.

3.8.4 Turf Fertilization Program

A regular program of fertilization shall be established to meet the requirements of paragraph GRASS PLANT QUALITY. A total of four pounds of Nitrogen per 1000 square feet shall be applied annually. Additional one pound Nitrogen applications shall be provided as grass color warrants.

3.9 PLANT MATERIAL QUALITY

3.9.1 General Requirements

Plant material shall be identified as native to the region of the site or as a specimen. Plant material shall be maintained as well shaped, well grown, vigorous plant material having healthy root systems. The plant material shall be maintained as free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems. Plant quality is determined by the growing conditions; climate and microclimate of the site for maintaining a healthy root system; and growth of the trunk and crown as follows.

3.9.2 Growth of Trunk and Crown

3.9.2.1 Deciduous Trees

Deciduous tree height to caliper relationship shall be maintained. Height of branching shall bear a relationship to the size and species of the tree and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

- a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

b. Specimen: The tree shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be indicated.

3.9.2.2 Palms

Palms shall be maintained to have healthy fronds or foliage as typical for the variety grown in the region of the site.

3.9.2.3 Deciduous Shrubs

Deciduous shrub height to number of primary stems shall be maintained. Shrubs shall be maintained as well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the site.

3.10 SHRUB MAINTENANCE

3.10.1 Trimming and Pruning

Trimming shall be performed to ensure the following:

- a. Safety.
- b. Quality (size, height, and shape).
- c. Health (removing broken, diseased branches).
- d. Rejuvenation (removing one third to one half of the older stems or branches).
- e. Visibility (signs, building entrances, motorist line of sight).

Shrubs shall be pruned to the requirements of paragraph PLANT MATERIAL QUALITY. Pruning shall be accomplished by trained and experienced personnel in accordance with ANSI A300. The typical growth habit of individual plant material or the theme shape of the hedge shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed.

3.10.2 Irrigation of Shrubs

Run-off, puddling and wilting shall be prevented.

3.10.3 Shrub Fertilization Program

A regular program of fertilization shall be established to meet the requirements of paragraph PLANT MATERIAL QUALITY. Use industry standards for foliage and root fertilizing the plant material inventoried.

3.11 TREE MAINTENANCE

3.11.1 Trimming and Pruning of Trees

Trimming shall be performed to ensure the following:

- a. Safety.
- b. Quality (size, height).

- c. Health (removing broken, diseased wood branches).
- d. Rejuvenation (removing one third to one half of the older stems or branches).
- e. Visibility (signs, building entrances, motorist line of sight).

Trees shall be pruned to meet the requirements of paragraph PLANT MATERIAL QUALITY. Pruning shall be accomplished by trained and experienced personnel in accordance with ANSI A300. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3.11.2 Irrigation of Trees

Run-off, puddling and wilting shall be prevented.

3.11.3 Tree Fertilization Program

A regular program of fertilization shall be established to meet the requirements of paragraph PLANT MATERIAL QUALITY. Use industry standards for foliage and root fertilizing the plant material inventoried.

3.11.4 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately.

3.12 RESTORATION AND CLEAN UP

3.12.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the maintenance operations shall be restored to original condition at Contractor's expense.

3.12.2 Clean Up

Excess and waste material shall be removed from the maintenance areas and dispose off site. Adjacent paved areas shall be cleaned as determined by the Contracting Officer.

3.13 CLEANING OF PAVED AREAS

Grass, weeds, leaves, and debris from mowing, clipping, and pruning shall be removed immediately. Excess and waste material shall be removed from paved areas and disposed off site. Debris, leaves shall be removed weekly.

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SECTION 03201

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SECTION 03201

STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 315	(1999) Details and Detailing of Concrete Reinforcement
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ACI 318/318R	(2002) Building Code Requirements for Structural Concrete
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185/A 185M	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
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ASTM A 370	(1997a) Mechanical Testing of Steel Products
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ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
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ASTM A 884/A 884M	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
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ASTM A 934/A 934M	(1997) Epoxy-Coated Prefabricated Steel Reinforcing Bars
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AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1998) Structural Welding Code - Reinforcing Steel
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication and Placement

The Contractor shall submit shop drawings which include: reinforcement steel placement drawings; reinforcement steel schedules showing quantity, size, shape, dimensions, weight per foot, total weights and bending details; and details of bar supports showing types, sizes, spacing and sequence.

SD-04 Samples

Epoxy-Coated Bars

Sample of coating material and 1.5 pounds of patching material shall be submitted with the delivery of the bars.

SD-07 Certificates

Epoxy-Coated Steel Bars

Written certification for coating material and coated bars shall be submitted with the delivery of the bars.

Reinforcing Steel

Certified copy of mill reports attesting that the reinforcing steel furnished meets the requirements specified herein, prior to installation of reinforcing steel.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the following requirements.

2.1.1 Steel Bars

Steel bars shall comply with the requirements of ASTM A 615/A 615M, deformed, of the grades, sizes and lengths shown.

2.1.1.1 Epoxy-Coated Bars

Epoxy-coated steel bars shall comply with the requirements of ASTM A 934/A 934M, including written certifications for coating material and coated bars, sample of coating material, and 0.5 pounds of patching material.

2.1.2 Steel Welded Wire Fabric

Steel welded wire fabric shall comply with the requirements of ASTM A 185/A 185M, wire sizes and spacings as shown. For wire with a specified yield strength (fy) exceeding 60,000 psi, fy shall be the stress corresponding to a strain of 0.35 percent.

2.1.2.1 Epoxy Coated Steel Welded Wire Fabric

Epoxy-coated steel welded wire fabric shall comply with the requirements of ASTM A 884/A 884M.

2.1.3 Accessories

2.1.3.1 Bar Supports

Bar supports shall comply with the requirements of ACI 315. Supports for bars in concrete with formed surfaces exposed to view or to be painted shall be plastic-coated wire, or precast concrete supports. Precast concrete supports shall be wedged-shaped, not larger than 3-1/2 by 3-1/2 inches, of thickness equal to that indicated for concrete cover and have an embedded hooked tie-wire for anchorage. Bar supports used in precast concrete with formed surfaces exposed to view shall be the same quality, texture and color as the finish surfaces.

2.1.3.2 Wire Ties

Wire ties shall be 16 gage or heavier black annealed wire. Ties for epoxy-coated bars shall be vinyl-coated or epoxy-coated.

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have material tests required by applicable standards and specified performed by an approved laboratory and certified to demonstrate that the materials are in conformance with the specifications. Tests, inspections, and verifications shall be performed and certified at the Contractor's expense.

2.2.1 Reinforcement Steel Tests

Mechanical testing of steel shall be in accordance with ASTM A 370 except as otherwise specified or required by the material specifications. Tension tests shall be performed on full cross-section specimens using a gage length that spans the extremities of specimens with welds or sleeves included. Chemical analyses of steel heats shall show the percentages of carbon, phosphorous, manganese, sulphur and silicon present in the steel.

PART 3 EXECUTION

3.1 FABRICATION AND PLACEMENT

Reinforcement steel and accessories shall be fabricated and placed as specified and shown and approved shop drawings. Fabrication and placement details of steel and accessories not specified or shown shall be in accordance with ACI 315 and ACI 318/318R or as directed. Steel shall be fabricated to shapes and dimensions shown, placed where indicated within specified tolerances and adequately supported during concrete placement. At the time of concrete placement all steel shall be free from loose, flaky rust, scale (except tight mill scale), mud, oil, grease or any other coating that might reduce the bond with the concrete.

3.1.1 Hooks and Bends

Steel bars, except epoxy-coated, shall be mill or field-bent. Epoxy-coated bars shall be mill-bent prior to coating. All steel shall be bent cold unless authorized. No steel bars shall be bent after being partially embedded in concrete unless indicated or authorized.

3.1.2 Welding

Welding of steel bars will be permitted only where indicated or authorized.

Welding shall be performed in accordance with AWS D1.4 except where otherwise specified or indicated.

3.1.3 Placing Tolerances

3.1.3.1 Spacing

The spacing between adjacent bars and the distance between layers of bars may not vary from the indicated position by more than one bar diameter nor more than 1 inch.

3.1.3.2 Concrete Cover

The minimum concrete cover of main reinforcement steel bars shall be as shown. The allowable variation for minimum cover shall be as follows:

MINIMUM COVER	VARIATION
6 inch	plus 1/2 inch
4 inch	plus 3/8 inch
3 inch	plus 3/8 inch
2 inch	plus 1/4 inch
1-1/2 inch	plus 1/4 inch
1 inch	plus 1/8 inch
3/4 inch	plus 1/8 inch

3.1.4 Splicing

Splices in steel bars shall be made only as required. Bars may be spliced at alternate or additional locations at no additional cost to the Government subject to approval.

3.1.4.1 Lap Splices

Lap splices shall be used only for bars smaller than size 14 and welded wire fabric. Lapped bars may be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than 1/5 the required length of lap or 6 inches.

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SECTION 03230

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SECTION 03230

STEEL STRESSING TENDONS AND ACCESSORIES FOR PRESTRESSED CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 315 (1999) Details and Detailing of Concrete Reinforcement

ACI 318/318R (1999) Building Code Requirements for Structural Concrete and Commentary

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 416/A 416M (1999) Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

ASTM A 421 (1998a) Uncoated Stress-Relieved Steel Wire for Prestressed Concrete

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

Installation drawings for tendons and accessories shall be submitted prior to commencing the work.

SD-03 Product Data

Prestressing Method and Equipment

Descriptions of proposed prestressing method and equipment shall be submitted prior to the start of prestressing operations.

Materials Disposition Records

Records which identify the incorporation of approved materials into the work shall be submitted before completion of the contract.

Prestressing Operations Records

Complete records of the prestressing operations shall be submitted before completion of the contract.

SD-06 Test Reports

Stressing Tendons and Accessories

Certified materials test reports shall be submitted for all required materials tests, note the specific standards followed in the performance of tests, show that materials comply with the applicable specifications, be submitted for each material shipment and be identified with specific lots prior to use of materials in the work.

SD-07 Certificates

Certification of Prestressing Technicians

Certificates for prestressing technicians shall be submitted prior to start of prestressing operations.

1.3 CERTIFICATION OF PRESTRESSING TECHNICIANS

Submitted certificates for prestressing technicians who will use the proposed system in the work shall certify by name that these technicians are thoroughly trained and skilled in the use of the system.

1.4 DELIVERY, STORAGE AND HANDLING OF MATERIALS

Materials shall be suitably wrapped, packaged or covered at the factory to prevent being affected by dirt, water and rust. Materials shall be protected against abrasion or damage during shipment and handling. Materials stored at the site shall be placed above ground on elevated, covered platforms.

PART 2 PRODUCTS

2.1 MATERIALS

Stressing tendons and accessories shall conform to the requirements of ACI 318/318R except as specified.

2.1.1 Stressing Tendons

Stressing tendons shall be clean and free of loose rust, scale and pitting. Unbonded tendons shall be permanently protected from corrosion with an approved applied coating.

2.1.1.1 Seven-Wire Stress-Relieved Strand and Strand Assemblies

Seven-wire stress-relieved strand and strand assemblies shall conform to ASTM A 416/A 416M, Grade 270, strand diameter as shown. Strand assemblies may be either shop or field assembled with anchor fittings positively attached to strands.

2.1.1.2 Stress-Relieved Wire and Wire Assemblies

Stress-relieved wire and wire assemblies shall conform to ASTM A 421, Type BA or WA, wire diameter as shown. Wire assemblies shall be shop assembled with anchor fittings positively attached to wires.

2.1.2 Accessories

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests performed on stressing tendons and accessories by an approved laboratory to demonstrate that the materials are in conformance with the specifications. These tests shall be at the Contractor's expense.

PART 3 EXECUTION

3.1 INSTALLATION

Stressing tendons and accessories shall be installed or placed as specified and as shown on contract and approved installation drawings. Installation details of stressing tendons and accessories not specified or shown shall be in accordance with ACI 315 or ACI 318/318R. Welding shall not be performed near or adjacent to stressing tendons. Stressing tendons shall not be installed until all welding has been completed on supports or any part which might be in contact with the tendons.

3.1.1 Prestressing Method and Equipment

Descriptions of the proposed prestressing methods and equipment indicating the manufacturer of all prestressing equipment, including tensioning jacks, stress measurement gages, dynamometers and load cells or other devices for measuring stressing loads, shall be provided by the contractor. Descriptions shall include certified calibration records for each set of jacking equipment and testing curves for stress measurement gages which show that the gages have been calibrated for the jacks for which they are to be used.

3.1.2 Installation Drawings

Detailed installation drawings for stressing tendons and accessories showing the type and size of stressing tendons and anchorages, erection methods, sequence of stressing and stressing calculations shall be provided by the Contractor.

3.1.3 Anchorages

Anchorages must be set in a plane normal to the axis of the tendons such that uniform bearing on the concrete is assured. Positive connecting anchorages rather than gripping types shall be used for anchoring embedded ends of tendons. Anchorages and anchor fittings shall be permanently protected against corrosion. Parallel wire anchorage wedges or cores shall be recessed within the members.

3.1.4 Tensioning Tendons

Tensioning of stressing tendons shall be as specified and shown. The stress induced in the tendons by any method of tensioning shall be determined independently by both (1) measurement of tendon elongation and

(2) direct measurement of force using a pressure gauge or load cell. If the results of these two measurements do not check each other and the theoretical values within 5 percent, the operation shall be carefully checked and the source of error determined and corrected before proceeding further. Concrete cylinder tests shall indicate a breaking strength of at least 6,000 psi before transfer of stress to ensure that the concrete strength is adequate for the requirements of the anchorages or for transfer through bond as well as meet camber or deflection requirements. The final prestress load in each unit after seating shall be as shown. Safety measures shall be taken by the Contractor to prevent accidental injury caused by failure of a stressing tendon or tendon component. The exposed ends of stressing tendons and anchorages shall be protected from damage during stressing operations to prevent failure.

3.1.4.1 Pretensioning

Strand tendons may be tensioned by jacking of groups of strands or may be tensioned individually by means of a single-strand jack. Before final tensioning, all tendons shall be brought to a uniform initial tension of approximately 1,000 pounds per strand per 200 feet of bed, with a minimum of 1,000 pounds and a maximum of 3,000 pounds per strand. The force corresponding to the initial tension shall be measured by a dynamometer or other approved method to aid in determining the final elongation. After this initial tensioning, the tendons shall be stressed to the total tension indicated on the drawings using hydraulic or mechanical equipment with gauges or dynamometers graduated and calibrated to accurately determine the load applied. Draped pretensioned strands shall be tensioned partially by jacking at the end of the bed and partially by uplifting or depressing strands, or they shall be held in their draped positions by means of rollers, pins or other approved methods and tensioned entirely by jacking. Approved low-friction devices shall be used at all points of change in slope of draped strands while tensioning draped strands, regardless of the tensioning method used. Cable stress shall be maintained between anchorages until the concrete has reached the specified compressive strength.

3.1.4.2 Detensioning

Forces from pretensioned strands shall be transferred to the concrete by either the multiple-strand release or the single-strand release method. The stress transfer shall not be performed until concrete strength, as indicated by test cylinders, has reached the specified transfer strength. If concrete has been heat-cured, the detensioning shall be done immediately following the curing period while the concrete is still warm and moist. During detensioning, the prestressing forces shall be kept nearly symmetrical about the vertical axis of the member and shall be applied in a manner that will minimize sudden loading. Eccentricity about the vertical axis shall be limited to one strand.

a. Multiple-Strand Release: In this method, all strands shall be detensioned simultaneously and the load transferred gradually to the concrete by hydraulic jacking.

b. Single-Strand Release: In this method, all strands shall be detensioned by slow heat-cutting the strands in accordance with a pattern and schedule as approved. The strands shall be heated using a low-oxygen flame until the metal gradually loses its strength, causing release of the strands to occur gradually. The low-oxygen flame shall be played along the strand for a minimum of five inches. Strands shall

be so heated that the failure of the first wire in each strand shall occur after the torch has been applied for a minimum of five seconds.

3.1.5 Accuracy of Stress and Elongation Measurement

3.1.5.1 Stress Measurement

Hydraulic gauges, dynamometers, load cells or other devices for measuring stressing load shall have an accuracy of reading within two percent for stress measurement. Gauges are required to have been calibrated for the jacks for which they are used within a period not exceeding 12 months. Recalibration shall be performed at any time that a gaging system shows indication of erratic results in the opinion of the Contracting Officer. Gauges shall indicate loads directly in pounds or be accompanied by a chart which converts dial readings into pounds.

3.1.5.2 Elongation Measurement

After the initial force has been applied to a tendon, reference points for measuring elongation due to additional tensioning forces shall be established. They shall be located according to the method of tensioning and type of equipment. The system used shall be capable of measuring the true elongation plus or minus 1/16-inch.

3.1.6 Prestressing Operations Records

The Contractor shall compile and submit complete prestressing operations records to the Contracting Officer. These records shall show the manufacturer, identification and description of materials and equipment including prestressing tendons and jacking and load measuring equipment; location of prestressing tendons; initial design tensioning loads, final design tensioning loads and actual tensioning loads for tendons; dates tensioning loads applied; and theoretical and actual elongations for tendons.

3.2 INSPECTION

The Contractor's facilities shall be open for inspection by the Contracting Officer at any time.

3.3 MATERIALS DISPOSITION RECORDS

Accurate materials disposition records identifying all materials incorporated into the work and showing the disposition of specific lots of approved tested materials shall be compiled by the Contractor.

-- End of Section --

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SECTION 03311

MARINE CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 182 (1991; R 1996) Burlap Cloth Made From Jute or Kenaf

AASHTO T 259 (1993) Resistance of Concrete to Chloride Ion Penetration

ACI INTERNATIONAL (ACI)

ACI 117 (1990) Tolerances for Concrete Construction and Materials

ACI 121R (1985) Quality Assurance Systems for Concrete Construction

ACI 201.2R (1992) Durable Concrete

ACI 211.1 (1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 214 (1977; R 1997) Recommended Practice for Evaluation of Strength Test Results of Concrete

ACI 301 (1999) Standard Specifications for Structural Concrete

ACI 304R (2000) Measuring, Mixing, Transporting, and Placing Concrete

ACI 304.2R (1996) Placing Concrete by Pumping Methods

ACI 305R (1999) Hot Weather Concreting

ACI 308 (1992) Curing Concrete

ACI 309R (1996) Consolidation of Concrete

ACI 315 (1999) Details and Detailing of Concrete Reinforcement

ACI 318/318M	(1995) Building Code Requirements for Structural Concrete
ACI 347R	(1994) Formwork for Concrete
ACI SP-2	(1992) ACI Manual of Concrete Inspection
ACI SP-15	(1995) Structural Concrete for Buildings ACI 301 with Selected ACI and ASTM References

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1997a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 496	(1997) Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 884/A 884M	(1996a ¹) Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
ASTM A 934/A 934M	(1997) Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM C 31/C 31M	(2000) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(2001) Concrete Aggregates
ASTM C 39/C 39M	(2001) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 94/C 94M	(1997) Ready-Mixed Concrete
ASTM C 138	(1992) Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(2000) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 173	(1994a ¹) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 227	(1990) Potential Alkali Reactivity of

	Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C 231	(1997) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 295	(1990) Petrographic Examination of Aggregates for Concrete
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 441	(1996) Effectiveness of Mineral Admixtures or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to Alkali-Silica Reaction
ASTM C 494/C 494M	(1999) Chemical Admixtures for Concrete
ASTM C 496	(1996) Splitting Tensile Strength of Cylindrical Concrete Specimens
ASTM C 595	(2000a) Blended Hydraulic Cements
ASTM C 597	(1983; R 1997) Pulse Velocity Through Concrete
ASTM C 618	(2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 805	(1997) Rebound Number of Hardened Concrete
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 920	(1995) Elastomeric Joint Sealants
ASTM C 989	(1999) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

ASTM C 1157	(1994; Rev. A) Blended Hydraulic Cement
ASTM C 1202	(1997) Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
ASTM C 1218/C 1218M	(1997) Water-Soluble Chloride in Mortar and Concrete
ASTM C 1240	(2000) Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar and Grout
ASTM C 1260	(1994) Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM D 512	(1989; R 1994) Chloride Ion in Water
ASTM D 516	(1990; R 1995) Sulfate Ion in Water
ASTM D 1179	(1993) Fluoride Ion in Water
ASTM D 1190	(1996) Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1339	(1990) Sulfite in Water
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3867	(1990) Nitrite-Nitrate in Water
ASTM E 329	(1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS SS-S-1614	(Rev. A) Sealants, Joint, Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Tar Concrete Pavements
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1.2 DEFINITIONS

- a. "Blending size" is an aggregate that complies with the quality requirements in ASTM C 33 and paragraph entitled "Aggregates" and as modified herein and can be blended with coarse and fine aggregate to produce a well graded combined grading.
- b. "Cementitious material" as used herein shall include portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.
- c. "Design strength" (f'_c) is the specified compressive strength of

concrete to meet structural design criteria.

- d. "Marine concrete" is that concrete that will be in contact with or subject to submersion, tidal variations, splash, or spray from water in navigable waterways and exposed to marine atmosphere.
- e. "Mixture proportioning" is a description of the proportions of a concrete mixture that were selected to enable it to meet the performance durability requirements, constructability requirements, and the initial and life-cycle cost goals.
- f. "Mixture proportions" is the concrete supplier's by-mass proportions to replicate the mixture design.
- g. "Pozzolan" is a silicious or silicious and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- h. "Field test strength" (fcr) is the required compressive strength of concrete to meet structural and durability criteria. Determine (fcr) during mixture proportioning process.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Reinforcing steel

Formwork

Construction joints

Reproductions of contract drawings are unacceptable.

SD-03 Product Data

Materials for curing concrete

Joint sealants

Joint filler

Epoxy bonding compound

Epoxy coatings

Non-shrink grout

Sealer-hardener

Preformed joint filler

Reinforcement supports

SD-05 Design Data

Mixture design

SD-06 Test Reports

Concrete mixture proportions

Natural pozzolan

Ground iron blast-furnace slag

Silica fume

Aggregates

Admixtures

Cement

Water

Reinforcement and protective coating

SD-07 Certificates

Silica fume manufacturer's supplier representative

Quality assurance

Field testing technician and testing agency

Mixture designs

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Comply with the requirements of ACI 301 and ASTM A 934/A 934M for job site storage of materials. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Concrete Mixture Design

At least 30 days prior to concrete placement, submit proportions for a concrete mixture for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement,

aggregate, fly ash, (or slag pozzolans), silica fume, ground slag, polypropylene fibers, anti-washout and other admixtures for underwater concreting, corrosion inhibitors; and applicable reference specifications. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submittal shall clearly indicate where each mixture will be used when more than one mix design is submitted. The approval of aggregate, silica fume, and pozzolan tests results shall have been within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement. The mixture shall be prepared by an accredited laboratory experienced in this field and under the direction of a licensed/registered civil engineer, who shall sign all reports and designs. Refer to Section 01451 CONTRACTOR QUALITY CONTROL.

1.6.2 Drawings

1.6.2.1 Reinforcing Steel

ACI 315. Provide bending and cutting diagrams, assembly diagrams, splicing placement and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Only complete drawings will be accepted.

1.6.2.2 Formwork

ACI 347R. Include design calculations indicating arrangement of forms, sizes and grades of supports (lumber), panels, and related components. Indicate placement schedule, construction, and location and method of forming control joints. Include locations of inserts, pipework, conduit, sleeves, and other embedded items. Furnish drawings and descriptions of shoring and reshoring methods proposed for slabs, beams, and other horizontal concrete members.

1.6.3 Certificates

1.6.3.1 Curing Concrete Elements

Submit proposed materials and methods for curing concrete elements.

1.6.3.2 Form Removal Schedule

Submit schedule for form removal indicating element and minimum length of time for form removal. Submit technical literature of forming material or liner, form release agent, form ties, and gasketing to prevent leakage at form and construction joints. Provide a full description of materials and methods to be used to patch form-tie holes.

1.6.3.3 Concrete Placement and Compaction

- a. Submit technical literature for equipment and methods proposed for use in placing concrete. Include pumping or conveying equipment including type, size and material for pipe, valve characteristics, and the maximum length concrete will be pumped. No adjustments shall be made to the mixture design to facilitate pumping.
- b. Submit technical literature for equipment and methods proposed for vibrating and compacting concrete. Submittal shall include technical literature describing the equipment including vibrator diameter, length, frequency, amplitude, centrifugal force, and

manufacturer's description of the radius of influence under load. Where flat work is to be cast, provide similar information relative to the proposed compacting screed or other method to ensure dense placement.

1.6.3.4 Silica Fume Manufacturer's Supplier Representative

Provide statement that the manufacturer's supplier representative will be present at batch plant to ensure proper mixture, including high range water reducer, and batching methods. Representative to attend and advise at finishing of sample slab.

1.6.3.5 Quality Assurance

Develop and submit for approval a quality control plan in accordance with the guidelines of ACI 121R and as specified herein. The plan shall include plans for the concrete supplier, the reinforcing steel supplier, and installer. Maintain a copy of ACI SP-15 and CRSI Manual of Practice at the project site.

1.6.3.6 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing any work.

- a. Work on concrete under this contract shall be performed by an ACI Concrete Field Testing Technician Grade 1 or Grade 2 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI SP-2.
- b. Testing agencies that perform testing services on reinforcing steel shall meet the requirements of ASTM E 329.
- c. Testing agencies that perform testing services on concrete materials shall meet the requirements of ASTM C 1077.

1.6.3.7 Mixture Designs

Provide a detailed report of materials and methods used, test results, and the field test strength (fcr) for marine concrete required to meet durability requirements.

1.6.4 Test Reports

1.6.4.1 Concrete Mixture Proportions

- a. Submit copies of test reports by independent test labs conforming to ASTM C 1077 showing that the mixture has been successfully tested to produce concrete with the properties specified and that mixture will be suitable for the job conditions. Test reports shall be submitted along with the concrete mixture proportions. Obtain approval before concrete placement.
- b. Fully describe the processes and methodology whereby mixture proportions were developed and tested and how proportions will be adjusted during progress of the work to achieve, as closely as possible, the designated levels of relevant properties.

1.6.4.2 Silica Fume

Submit test results in accordance with ASTM C 1240 for silica fume. Data shall be based upon tests performed within 6 months of submittal.

1.6.4.3 Aggregates

Submit test results for aggregate quality in accordance with ASTM C 33, and the combined gradation curve for grading proposed for use in the work and used in the mixture qualification, and ASTM C 295 for results of petrographic examination. Where there is potential for alkali-silica reaction, provide results of tests conducted in accordance with ASTM C 227 or ASTM C 1260. Submit results of all tests during progress of the work in tabular and graphical form as noted above, describing the cumulative combined aggregate grading and the percent of the combined aggregate retained on each sieve.

1.6.4.4 Admixtures

Submit test results in accordance with ASTM C 494/C 494M and ASTM C 1017 for concrete admixtures, ASTM C 260 for air-entraining agent, and manufacturer's literature and test reports for corrosion inhibitor and anti-washout admixture. Submitted data shall be based upon tests performed within 6 months of submittal.

1.6.4.5 Cement

Submit test results in accordance with ASTM C 150 portland cement and/or ASTM C 595 and ASTM C 1157 for blended cement. Submit current mil data.

1.6.4.6 Water

Submit test results in accordance with ASTM D 512 and ASTM D 516.

1.6.4.7 Reinforcement and Protective Epoxy Coating

Provide epoxy coating manufacturer's and epoxy coating applicator's test data sheets certifying that applied coating meets the requirements of ASTM A 934/A 934M.

1.6.5 Field Samples

1.6.5.1 Slab Finish Sample of V Groove Finish

Install minimum of 4 by 4 foot slab. Finish as required by specification. Silica fume manufacturer's supplier representative will attend and advise.

1.6.5.2 Underwater Concrete Sample

Place concrete in four 5 gallon buckets below water. Permanently mark as "7 days," "14 days," "28 days," and "Extra." Include date and station. Provide specimen sets at every 10 cubic yard of concrete with a minimum of one set per day of underwater concrete placement. Retrieve specimens at specified intervals. Extract 4 inch diameter by 10 inch long core and test in accordance with ASTM C 39/C 39M.

PART 2 PRODUCTS

2.1 CONCRETE

2.1.1 Durability and Strength

ACI 201.2R and ACI 211.1. Required 28 days concrete strength is shown on the plan.

2.1.2 Contractor-Furnished Mixture Proportions

- a. Strength and Water-Cementitious Materials Ratio. Strength requirements shall be based on 28-day compressive strength determined on 6 by 12 inch cylindrical specimens in accordance with ASTM C 39/C 39M. The specified compressive strength of the concrete (f'c) for each portion of the structure shall meet the requirements in the contract documents.
- b. The mixture proportions for marine concrete shall be developed by the Contractor to produce the design strength (f'c) and to provide durability, workability, and mixture consistency to facilitate placement, compaction into the forms and around reinforcement without segregation or bleeding. The requirements for durability consideration specified in Table 1 and subparagraph "f" below shall be incorporated in the mixture proportions.

Table 1 - Concrete Quality Requirements

Zone	Exposure Condition	Maximum W/CM	Minimum quantity of cementitious material lb/yd3	Minimum quantity of portland cement lb/yd3
Submerged (1) and tidal (2)	(a) Directly exposed to salt water	0.40	675	505
	(b) Subject to severe abrasion	0.40	675	505
Splash (3)	(a) Directly exposed to salt water	0.40	675	505
Atmospheric (4)	(a) Directly exposed to marine atmosphere	0.40	675	505
	(b) Protected from direct exposure to marine atmosphere	0.45	607	505

- c. The maximum mass of natural pozzolans, ground granulated blast-furnace slag, or silica fume that is included in the calculation of water-to-cementitious materials ratio shall not exceed the following limits:

(1) The weight of ground granulated blast-furnace slag conforming to ASTM C 989 shall not exceed 50 percent of the weight of cement.

The slag used in manufacture of a Type IS or ISM blended hydraulic cement conforming to ASTM C 595 shall be included in the calculated percentage. Higher percentage of ground granulated blast-furnace slag may be used if tests are made using actual job materials to ascertain the early and later age strengths and durability performance specified, and the use is approved by the owner.

(2) The maximum silica fume content shall not exceed 10 percent by mass of the cementitious material. The silica fume shall originate from the manufacture of silicon metal and ferro-silicon alloys. A high-range water reducer shall be used with silica fume for proper dispersion of the silica fume.

(3) The minimum amount of portland cement is 50 percent of the total mass of cementitious material.

- d. Air Content. Concrete that will be subject to destructive exposure (other than loading and wear in a passive environment) such as freezing and thawing, severe weathering, or deicing chemicals shall be air entrained and shall conform to the air limits specified in ACI 301.
- e. Slump. The concrete mixture shall be proportioned to have, at the point of deposit, a maximum slump of 4 inches as determined by ASTM C 143. Where an ASTM C 494/C 494M, Type F or G admixture is used, the slump after the addition of the admixture shall be no less than 6 inches nor greater than 8 inches. Slump tolerances shall comply with the requirements of ACI 117.
- f. Chloride Ion Penetration. To ensure the durability of concrete in marine environment, concrete shall be proportioned to have the chloride ion penetration test in accordance with ASTM C 1202, and be below 750 coulombs for concrete specimens tested at 28 days.

2.1.3 Required Average Strength of Concrete

The minimum compressive strength (f_{cr}) of the selected mixture shall equal or exceed the strength required under ACI 301 for laboratory mixture designs and which passes the test indicated in the subparagraph entitled "Chloride Ion Penetration." The average compressive strength produced under field tests shall be the minimum compressive strength (f_{cr}) required during construction.

2.2 MATERIALS

2.2.1 Cement

ASTM C 150, Type I or II and/or ASTM C 595, Type IP(MS) or IS(MS) and ASTM C 1157, Type MS blended cement except as modified herein. The tricalcium aluminate (C3A) content shall not be less than 4 percent to provide protection for the reinforcement and shall not be more than 10 percent to obtain concrete that is resistant to sulfate attack. Blended cements shall consist of a mixture of ASTM C 150 cement and one of the following materials: ASTM C 618 pozzolan or fly ash, or ASTM C 989 ground granulated blast-furnace slag. Use one manufacturer for each type of cement, ground

slag, fly ash, and pozzolan.

2.2.1.1 Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Types N and F. Add with cement.

2.2.1.2 Silica Fume

ASTM C 1240.

2.2.2 Water

Water shall comply with the requirements of ASTM C 94/C 94M and the chloride and sulfate limits in accordance with ASTM D 512 and ASTM D 516. Mixing water shall not contain more than 500 parts per million of chlorides as Cl and not more than 100 parts per million of sulfates as SO₄. Water shall be free from injurious amounts of oils, acids, alkalies, salts, and organic materials. Where water from reprocessed concrete is proposed for use in the work, submit results of tests to verify that the treatment has negated adverse effects of deleterious materials.

2.2.3 Aggregates

ASTM C 33, except as modified herein.

- a. The combined aggregates in the mixture (coarse, fine, and blending sizes) shall be well graded from the coarsest to the finest with not more than 18 percent nor less than 8 percent, unless otherwise permitted, of the combined aggregate retained on any individual sieve with the exceptions that the No. 50 may have less than 8 percent retained, sieves finer than No. 50 shall have less than 8 percent retained, and the coarsest sieve may have less than 8 percent retained. Use blending sizes where necessary, to provide a well graded combined aggregate. Reports of individual aggregates shall include standard concrete aggregate sieve sizes including 1 1/2 inches, one inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100.
- b. Provide aggregates for exposed concrete from one source, ASTM C 227. Do not provide aggregates that react deleteriously with alkalies in cement. Refer to appendix, paragraph entitled "Test Method C227" of ASTM C 33 for expansion limits. Provide aggregate containing no deleterious material properties as identified by ASTM C 295.
- c. Where a size designation is indicated, that designation indicates the nominal maximum size of the coarse aggregate.
- d. Aggregate may contain materials deleteriously reactive with alkalies in the cement, if cement contains less than 0.60 percent alkalies (percent Na₂O plus .658 percent K₂O). Provide a material such as fly ash, slag, or silica fume as specified to be effective in preventing harmful expansion due to alkali-aggregate reaction by ASTM C 441.
- e. Where historical data is used, provide aggregates from the same sources having the same size ranges as those used in the concrete

represented by historical data.

- f. Marine aggregate may be used when conforming to ASTM C 33 and if it originates from the up-current side of the land mass and it has been washed by the fresh water so that the total chloride and sulfate content of the concrete mixture does not exceed the limits defined herein.

2.2.4 Nonshrink Grout

ASTM C 1107.

2.2.5 Admixtures

- a. Provide chemical admixtures that comply with the requirements shown below and in accordance with manufacturer's recommendations, and appropriate for the climatic conditions and the construction needs. Do not use calcium chloride or admixtures containing chlorides from other than impurities from admixture ingredients.
- b. Provide minimum concentrations of corrosion-inducing chemicals as shown in Table 2 below. For concrete that may be in contact with prestressing steel tendons, the concentration shall not exceed 60 percent of the limits given in Table 2. For the concentration in grout for prestressing ducts, do not exceed 25 percent of the limits in Table 2.

Table 2 - Limits on Corrosion-Inducing Chemicals

Chemical*	Limits, Percent**	Test Method
Chlorides	0.10	ASTM D 512
Fluorides	0.10	ASTM D 1179
Sulphites	0.13	ASTM D 1339
Nitrates	0.17	ASTM D 3867

* Limits refer to water-soluble chemicals

** Limits are expressed as a percentage of the mass of the total cementitious materials.

- c. Provide anti-washout admixtures for underwater placement with a proven record of performance and compatible with the chosen cement.
- d. The total alkali content shall not increase the total sodium-oxide equivalent alkali content of the concrete by more than 0.5 lb/yd³.

2.2.5.1 Air Entraining Admixture

Provide air entraining admixtures conforming to ASTM C 260. Provide the admixture of such a type and dosage that the total air content in the hardened concrete can be readily maintained within the limits specified in Table 3.

Table 3 - Air Content

Nominal maximum size of coarse aggregate, inch(es)	Size Number	Total air content, percent by volume
3/8	8	6-10

Table 3 - Air Content

Nominal maximum size of coarse aggregate, inch(es)	Size Number	Total air content, percent by volume
1/2	7	5-9
3/4	67	4-8
1	57	3.5-6.5
1 1/2	467	3-6
2	357	2.5-5.5
3	-	1.5-4.5

2.2.5.2 Retarding

ASTM C 494/C 494M, Type B, D, or G.

2.2.5.3 Water Reducing

ASTM C 494/C 494M, Type A, E, or F.

2.2.5.4 High Range Water Reducer (HRWR)

ASTM C 494/C 494M, Type F and ASTM C 1017.

2.2.5.5 Corrosion Inhibitor

DCI-S shall be used. Dosage shall be minimum 3 gal/cy.

2.2.5.6 Anti-Washout

RHEOMAC UW 450 shall be used. Dosage shall be minimum 10 fl oz per 100 lbs of cementitious materials. Submit manufacturer's literature, test result and written recommendations with concrete mix design.

2.2.6 Materials for Forms

Provide wood, plywood, or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects.

Plywood: PS-1, B-B concrete form panels or better. Steel form surfaces shall not contain irregularities, dents, or sags.

2.2.6.1 Form Ties and Form-Facing Material

- a. Provide a form tie system that does not leave mild steel after break-off or removal any closer than 2 inches from the exposed surface. Do not use wire alone. Form ties and accessories shall not reduce the effective cover of the reinforcement.
- b. Form-facing material shall be structural plywood or other material that can absorb air trapped in pockets between the form and the concrete and some of the high water-cementitious materials ratio surface paste. Maximum use is three times. Provide forms with a form treatment to prevent bond of the concrete to the form.
- c. As an alternate to using an absorptive wood form contact face as a form liner, use "Zendrain" or an approved equal in strict accordance with the manufacturer's recommendations.

2.2.7 Reinforcement

2.2.7.1 Reinforcing Bars

ACI 301 unless otherwise specified. ASTM A 615/A 615M with the bars marked A, Grade 60. Prefabricated epoxy coated, ASTM A 934/A 934M. Do not use uncoated reinforcing steel.

2.2.7.2 Mechanical Reinforcing Bar Connectors

ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar. Coat connectors in accordance with the same requirements as reinforcing bars.

2.2.7.3 Epoxy Coated Welded Wire Fabric

ASTM A 185 and ASTM A 884/A 884M Type 2. Provide flat sheets of welded wire fabric for slabs and toppings.

2.2.7.4 Epoxy Coated Wire

ASTM A 82 or ASTM A 496 and ASTM A 934/A 934M.

2.2.8 Materials for Curing Concrete

2.2.8.1 Impervious Sheeting

ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.2.8.2 Pervious Sheeting

AASHTO M 182.

2.2.8.3 Liquid Membrane-Forming Compound

ASTM C 309, white-pigmented, Type 2, Class B.

2.2.9 Liquid Chemical Sealer-Hardener Compound

Provide magnesium fluosilicate compound which when mixed with water seals and hardens the surface of the concrete. Do not use on exterior slabs exposed to freezing conditions. Compound shall not reduce the adhesion of resilient flooring, tile, paint, roofing, waterproofing, or other material applied to concrete.

2.2.10 Expansion/Contraction Joint Filler

ASTM D 1751 or ASTM D 1752, 1/2 inch thick, unless otherwise indicated.

2.2.11 Joint Sealants

2.2.11.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D 1190 or ASTM C 920, Type M, Class 25, Use T.

2.2.11.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C 920, Type M, Grade NS, Class 25, Use T. FS SS-S-1614.

2.2.12 Epoxy Bonding Compound

ASTM C 881. Provide Type I for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; and Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40 degrees F; Class B if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

PART 3 EXECUTION

3.1 FORMS

- a. ACI 301. Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width shall be a minimum of 4 inches greater than indicated. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Forms submerged in water shall be watertight.
- b. Provide formwork with clean-out openings to permit inspection and removal of debris. Formwork shall be gasketed or otherwise rendered sufficiently tight to prevent leakage of paste or grout under heavy, high-frequency vibration. Use a release agent that does not cause surface dusting. Limit reuse of plywood to no more than three times. Reuse may be further limited by the Contracting Officer if it is found that the pores of the plywood are clogged with paste to the degree that the wood does not absorb the air or the high water-cementitious materials ratio concrete surface.
- c. Patch form tie holes with a nonshrink patching material in accordance with the manufacturer's recommendations and subject to approval.

3.1.1 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

3.1.2 Removal of Forms and Supports

After placing concrete, forms shall remain in place for the time periods specified in ACI 347R, except for concrete placed underwater, forms shall remain in place 48 hours. Prevent concrete damage during form removal.

3.1.2.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C 39/C 39M test results of field-cured samples from a representative portion of the structure or other approved and calibrated non-destructive testing techniques show that

the concrete has reached a minimum of 85 percent of the design strength.

3.2 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Remove rust, scale, oil, grease, clay, or foreign substances from reinforcing that would reduce the epoxy coating bond from reinforcing. Do not tack weld. Inspect placed steel reinforcing for coating damage prior to placing concrete. Repair all visible damage.

3.2.1 Epoxy Coated Reinforcing

Shall meet the requirements of ASTM A 934/A 934M including Appendix X2, "Guidelines for Job Site Practices" except as otherwise specified herein.

3.2.1.1 Epoxy Coated Reinforcing Steel Delivery, Handling, and Storage

Record coating lot on each shipping notice and carefully identify and re-tag bar bundles from bending plant. Provide systems for handling coated bars which have padded contact areas, nylon slings, etc., all free of dirt and grit. Lift bundled coated bars with strong back, multiple supports, or platform bridge to prevent sagging and abrasion. Bundling bands shall be padded where in contact with bars. Do not drop or drag bars or bundles. Store coated bars both in shop and in field, aboveground, on wooden or padded cribbing. Space the dunnage close enough to prevent excessive sags.

Stack large quantities of straight bars with adequate protective blocking between layers. Schedule deliveries of epoxy coated bars to the job site to avoid the need for long term storage. Protect from direct sunlight and weather. Bars to be stored longer than 12 hours at the job site shall be covered with opaque polyethylene sheeting or other suitable equivalent protective material.

3.2.1.2 Epoxy Coated Steel Reinforcing Steel Placement and Coating Repair

Carefully handle and install bars to minimize job site patching. Use the same precautions as described above for delivery, handling, and storage when placing coated reinforcement. Do not drag bars over other bars or over abrasive surfaces. Keep bar free of dirt and grit. When possible, assemble reinforcement as tied cages prior to final placement into the forms. Support assembled cages on padded supports. It is not expected that coated bars, when in final position ready for concrete placement, will be completely free of damaged areas; however, excessive nicks and scrapes which expose steel will be cause for rejection. Criteria for defects which require repair and for those that do not require repair are as indicated. Inspect for defects and provide required repairs prior to assembly. After assembly, reinspect and provide final repairs.

- a. Immediately prior to application of the patching material, any rust and debonded coating shall be manually removed from the reinforcement by suitable techniques employing devices such as wire brushes and emery paper. Care shall be exercised during this surface preparation so that the damaged areas are not enlarged more than necessary to accomplish the repair. Damaged areas shall be clean of dirt, debris, oil, and similar materials prior to application of the patching material.
- b. Repair and patching shall be done in accordance with the patching material manufacturer's recommendations. These recommendations, including cure times, shall be available at the job site at all times.

- c. Allow adequate time for the patching materials to cure in accordance with the manufacturer's recommendation prior to concrete placement.
- d. Rinse placed reinforcing bars with fresh water to remove chloride contamination prior to placing concrete.

3.2.2 Reinforcement Supports

Place reinforcement and secure with noncorrodible chairs, spacers, or metal hangers. Support reinforcement on the ground with concrete or other noncorrodible material, having a compressive strength equal to or greater than the concrete being placed.

ASTM A 934/A 934M. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable material. Wire bar supports shall be coated with dielectric material, compatible with concrete, for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy coated. Spreader bars, where used, shall be epoxy coated. Proprietary combination bar clips and spreaders used in construction with epoxy-coated reinforcing bars shall be made corrosion resistant or coated with dielectric material. Epoxy-coated bars shall be tied with plastic-coated tie wire; or other materials acceptable to the Contracting Officer.

3.2.3 Splicing

As indicated. For splices not indicated, ACI 301. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches.

3.2.4 Cover

Concrete cover for reinforcement is shown in Table 4. Placement tolerance is plus 1/4 inch. The cover to the principle reinforcing bars shall be not less than 2 times the nominal maximum aggregate size nor less than 1.5 times the effective diameter of the reinforcing bars.

Table 4 - Minimum Concrete Cover Over Reinforcement

Zone	Cover over reinforcing steel	Cover over post-tensioning ducts
Atmospheric zone not subject to salt spray	2.5 in.	3 in.
Tidal, splash, and atmospheric zone subject to salt spray	3.0 in.	3.5 in.
Submerged zone	2.5 in.	3 in.
Cover of stirrups	1/2 in. less than those listed above	-

3.2.5 Setting Miscellaneous Material and Prestress Anchorages

Place and secure anchors, bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete. Electrically isolate exposed steel work and its anchor systems from the primary steel reinforcement with at least 2 inches of concrete. Coat exposed steel work to reduce corrosion. Take particular care to ensure against corrosion on edges and horizontal surfaces. Use epoxy coatings for protection of carbon steel plates and fittings.

3.2.6 Construction Joints

Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

3.2.7 Expansion Joints and Contraction Joints

Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Place contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Sawed joints shall be completed within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.3 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C 94/C 94M, ACI 301, and ACI 304R, except as modified herein. Batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances: 1 per cent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch tickets imprinted with mix identification, batch size, batch design and measured weights, moisture in the aggregates, and time batched for each load of ready mix concrete. When a pozzolan is batched cumulatively with the cement, it shall be batched after the cement has entered the weight hopper.

3.3.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

Adjust batch proportions to replicate the mixture design using methods provided in the approved quality assurance plan. Base the adjustments on results of tests of materials at the batch plant for use in the work. Maintain a full record of adjustments and the basis for each.

3.3.2 Mixing

ASTM C 94/C 94M and ACI 301. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional

water may be added, if both the specified maximum slump and water-cementitious material ratio are not exceeded. When water is added, an additional 30 revolutions of the mixer at mixing speed is required. If time of discharge exceeds time required by ASTM C 94/C 94M, submit a request along with description of precautions to be taken. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.3.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.4 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other or lifts for vertical construction. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

3.4.1 Vibration

Comply with the requirements of ACI 309R and ASTM A 934/A 934M using vibrators with a minimum frequency of 9000 vibrations per minute (VPM). Use only high cycle or high frequency vibrators. Motor-in-head 60 cycle vibrators may not be used. For walls and deep beams, use a minimum of two vibrators with the first to melt down the mixture and the second to thoroughly consolidate the mass. Provide a spare vibrator at the casting site whenever concrete is placed. Place concrete in 18 inch maximum vertical lifts. Insert and withdraw vibrators approximately 18 inches apart. Penetrate at least 8 inches into the previously placed lift with the vibrator when more than one lift is required. Extract the vibrator using a series of up and down motions to drive the trapped air out of the concrete and from between the concrete and the forms.

For slab construction use vibrating screeds designed to consolidate the full depth of the concrete. Where beams and slabs intersect, use an internal vibrator to consolidate the beam. Do not vibrate concrete placed with anti-washout admixtures. Vibrators shall be equipped with rubber vibrator heads.

3.4.2 Pumping

ACI 304R and ACI 304.2R. Pumping shall not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment shall not exceed 2 inches. Do not use pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of coarse aggregate to 33 percent of the diameter of the pipe. Maximum size of well rounded

aggregate shall be limited to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.4.3 Hot Weather

ACI 305R. Maintain required concrete temperature using Figure 2.1.5, "Effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface Moisture From Concrete" in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.5 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT

3.5.1 Defects

Repair formed surfaces by removing minor honeycombs, pits greater than one square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347R. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise indicated.

3.5.2 Formed Surfaces

3.5.2.1 Tolerances

ACI 117 and as indicated.

3.5.2.2 As-Cast Rough Form

Provide for surfaces not exposed to public view. Patch holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inch in height.

3.5.2.3 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Patch tie holes and defects and

completely remove fins.

3.6 FINISHES FOR HORIZONTAL CONCRETE SURFACES

3.6.1 Finish

ACI 301. Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.6.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. After the concrete has been placed, consolidated, struck off, and leveled, the surface shall be roughened with stiff brushes of rakes before final set.

3.6.1.2 Floated

Slabs on grade where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float shall begin when the surface has stiffened sufficiently to permit the operation.

3.6.1.3 Concrete Containing Silica Fume

Finish using magnesium floats or darbies.

3.6.1.4 Broomed

Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3.6.1.5 V Groove Finish

After floating finish screed the concrete with a V groove template. Round edges and joints with an edger having a radius of 1/8 inch.

3.7 CURING AND PROTECTION

- a. ACI 301 and ACI 308 unless otherwise specified. Prevent concrete from drying by misting surface of concrete. Begin curing immediately following final set. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, by rain or running water, adverse weather conditions, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be

objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. For concrete slabs or wide beams containing silica fume, fog spray and install wind breaks to ensure 100 percent relative humidity until wet curing is started.

- b. Wet cure marine concrete using potable water for a minimum of 7 days. Do not allow construction loads to exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage.

3.7.1 Moist Curing

Remove water without erosion or damage to the structure.

3.7.1.1 Ponding or Immersion

Continually immerse the concrete throughout the curing period. Water shall not be 20 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.7.1.2 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.7.1.3 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.7.1.4 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.7.2 Liquid Membrane-Forming Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen

which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2 .1.5, "effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface Moisture From Concrete" in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

3.7.2.1 Application

Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Respray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

3.7.2.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

3.7.3 Liquid Chemical Sealer-Hardener

Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. The sealer-hardener shall not be applied until the concrete has been moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

3.7.4 Curing Periods

Moist cure concrete using potable water for a minimum of 7 days. Continue additional curing for a total period of 21 days. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by the Contracting Officer.

3.8 FIELD QUALITY CONTROL

3.8.1 Evaluation of Mixture Designs

- a. The adequacy of the mixture design to produce the minimum specified strength and durability shall be confirmed by testing field batches, casting concrete in a slab and a wall at the job using job materials, equipment, and personnel, and testing the hardened concrete as described herein. The slab shall be at least 8 feet square and have thickness of at least 8 inches. The wall shall be 8 feet long, 4 feet high, and at least 8 inches thick. Slump shall not exceed the slump proposed for the work. Water cure the castings for 7 days.

- b. Test the fresh concrete as follows:
- (1) Slump in accordance with ASTM C 143.
 - (2) Air content in accordance with ASTM C 231 or ASTM C 173.
 - (3) Unit weight in accordance with ASTM C 138.
 - (4) For strength, cast nineteen 6 by 12 inch cylinders in accordance with ASTM C 31/C 31M.
- c. Test 6 by 12 inch cylinders cast under subparagraph b above as follows:
- (1) Measure and weigh each specimen to determine unit weight as they are stripped from the molds.
 - (2) Test specimens to be tested at each age for pulse velocity through concrete in accordance with ASTM C 597.
 - (3) Two at each age of 24 hours and 3 and 7 days in accordance with ASTM C 39/C 39M.
 - (4) Three at each age of 28, 56, and 90 days in accordance with ASTM C 39/C 39M</ RID>.
 - (5) Two at each age of 28 and 90 days in accordance with ASTM C 496.
- d. Sampling and determination of water soluble chloride ion content in accordance with ASTM C 1218/C 1218M. Maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits of Table 5 below.
- e. Sampling and determination of chloride ion penetration (ponding test) in accordance with AASHTO T 259.

Table 5 - Maximum Chloride Ion Content for Corrosion Protection

Type of Member	Maximum water soluble chloride ion (Cl) in concrete, percent by weight of cement
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.08
Reinforced concrete that will be dry or protected from moisture in service	0.15
Other reinforced concrete construction	0.30

- f. Submit test results for evaluation and acceptance.

3.8.2 Sampling

- a. ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31/C 31M for making test specimens.
- b. Sample concrete on a random basis except where a batch appears to be deficient and the test can be used to verify the observed deviation. Identify samples so taken in a manner that they can be segmented from other tests. Obtain at least one sample for each 100 cubic yards, or fraction thereof, of each design mixture of concrete placed in any one day. When the total quantity of concrete with a given design mixture is less than 50 cubic yards, the strength tests may be waived by the Contracting Officer, if in his judgment, adequate evidence of satisfactory strength is provided.

3.8.3 Testing

3.8.3.1 Slump Tests

ASTM C 143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved high range water reducing (HRWR) admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 10 cubic yards (maximum) of concrete.

3.8.3.2 Temperature Tests

- a. Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions below 50 degrees F and above 80 degrees F for each batch (minimum) or every 10 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.
- b. Determine temperature of each composite sample in accordance with ASTM C 1064. When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40 degrees F for more than 3 successive days, concrete shall be delivered to meet the following minimum temperature at the time of placement:
 - (1) 55 degrees F for sections less than 12 inches in the least dimension
 - (2) 50 degrees F for sections 12 to 36 inches in the least dimension
 - (3) 45 degrees F for sections 36 to 72 inches in the least dimension
 - (4) 40 degrees F for sections greater than 72 inches in the least dimension
- c. The minimum requirements may be terminated when temperatures above 50 degrees F occur during more than half of any 24 hour duration. The temperature of concrete at time of placement shall not exceed 90 degrees F.

3.8.3.3 Compressive Strength Tests

ACI 214 tests for strength - conduct strength tests of concrete during construction in accordance with the following procedures:

- a. Mold and cure six 6 by 12 inch cylinders from each sample taken in accordance with ASTM C 31/C 31M. Prevent evaporation and loss of water from the specimen.
- b. Test cylinders in accordance with ASTM C 39/C 39M. Test one cylinder at 3 days, two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. The compressive strength test results for acceptance shall be the average of the compressive strengths from the two specimens tested at 28 days. If one specimen in a test shows evidence of improper sampling, molding or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result. If both specimens in a test show any defects, the Contracting Officer may allow the entire test to be discarded.
- c. If the average of any three consecutive strength test results is less than the specified strength (f'_c) or the minimum test strength (f_{cr}) for durability, whichever is higher, by more than 500 psi, take a minimum of three core samples in accordance with ASTM C 42/C 42M, from the in-place work represented by the low test results. Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.
- d. Strength test reports shall include location in the work where the batch represented by a test was deposited, batch ticket number, time batched and sampled, slump, air content (where specified), mixture and ambient temperature, unit weight, and water added on the job. Reports of strength tests shall include detailed information of storage and curing of specimens prior to testing.
- e. Final reports shall be provided within 7 days of test completion.

3.8.3.5 Chloride Ion Concentration

ACI 318/318M. Determine water soluble chloride ion concentration. Perform test once for each mix design.

3.8.4 Non-Destructive Tests

Non-destructive tests - use of the rebound hammer in accordance with ASTM C 805, ASTM C 597, or other non-destructive processes may be permitted by the Contracting Officer in evaluating the uniformity and relative concrete strength in place, or for selecting areas to be cored.

Evaluate and validate test results conducted on properly calibrated equipment in accordance with standard ASTM procedures indicated

3.8.4.1 Core Tests

Obtain and test cores in accordance with ASTM C 42/C 42M. If concrete in the structure is dry under service conditions, air dry cores (temperature 60 to 80 degrees F, relative humidity less than 60 percent) for 7 days

before testing and test dry. If concrete in the structure will be more than superficially wet under service conditions, test the cores, after moisture conditioning, in accordance with ASTM C 42/C 42M.

Take at least three representative cores from each member or area of concrete in place that is considered potentially deficient. Impair the strength of the structure as little as possible. If, before testing, cores show evidence of having been damaged subsequent to or during removal from the structure, take replacement cores.

Fill core holes with low slump concrete or mortar of a strength equal to or greater than the original concrete.

The Contracting Office will evaluate and validate core tests in accordance with the specified procedures. Before testing in compression, test each core to determine pulse velocity through concrete in accordance with ASTM C 597. Correlate pulse velocity of concrete cores with pulse velocity of in-place concrete.

3.8.5 Acceptance of Concrete Strength

3.8.5.1 Standard Molded and Cured Strength Specimens

When the averages of all sets of three consecutive compressive strength test results equal or exceed the design compressive strength (f'_c) or the required field test strength (f_{cr}) whichever is higher, and no individual strength test falls below the specified compressive strength (f'_c) or the required field durability strength (f_{cr}) by more than 500 psi, whichever is higher. These criteria also apply when accelerated strength testing is specified unless another basis for acceptance is specified.

3.8.5.2 Non-Destructive Tests

Non-destructive tests may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria.

3.8.5.3 Core Tests

When the average compressive strengths of the representative cores are equal to at least 85 percent of the design strength (f'_c) or the required average test strength (f_{cr}), whichever is higher, and if no single core is less than 75 percent of the specified strength (f'_c) or the required average field test strength (f_{cr}), whichever is higher, strength of concrete is satisfactory.

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SECTION 03350

CAST-IN-PLACE TREMIE CONCRETE GROUT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 143	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(2000) Portland Cement
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 404	(1997) Aggregates for Masonry Grout
ASTM C 494	(1999) Chemical Admixtures for Concrete
ASTM C 94	(1997) Ready-Mixed Concrete
ASTM D 448	(1986; R 1998) Sizes of Aggregate for Road and Bridge Construction

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Proportions of Mix

The results of trail mix along with a statement giving the maximum nominal fine aggregate size and the proportions of all ingredients that will be used in the manufacturer of each strength of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from a independent commercial testing laboratory or the quarry control laboratory of the ready mix concrete supplier, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

SD-06 Test Reports

Test Reports

Certified copies of laboratory test reports, including all test data, for aggregate, and admixtures. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

SD-07 Certificates

Cementitious Materials

Manufacturer's certification of compliance accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished. No cement shall be used until notice of acceptance has been given. Cement may be subjected to check testing by the Government from samples obtained at the mill at transfer points, or at the project site.

1.3 STORAGE OF MATERIALS

Cement aggregates and admixtures shall be stored in such a manner as to prevent their deterioration or the intrusion of foreign matter. A material which has deteriorated or which has been damaged shall not be used for concrete and shall be promptly removed from the site.

1.4 TESTING

1.4.1 Slump

Standard slump tests as described in ASTM C 143. (Modification: Sampling of concrete for slump test shall be taken after at least 1/4 cubic yard of concrete has been discharged) will be made periodically during the placement of concrete by the Contractor to ensure that the slump for which the concrete has been designed is met. Any concrete batch tested and showing slumps exceeding the specified tolerance shall be rejected. Any concrete placed prior to slump testing shall be the sole responsibility of the Contractor and shall be rejected should the subsequent slump test of the batch in question indicate that the slump tolerance is exceeded. All rejected concrete shall be promptly removed and properly replaced. All costs resulting therefrom shall be borne by the Contractor.

PART 2 PRODUCTS

2.1 ASBESTOS PROHIBITION

No asbestos containing materials or equipment shall be used under this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

2.2 CEMENT

Portland Cement shall conform to the requirements of ASTM C 150, type II or as recommended by the manufacturer.

2.3 CONCRETE AGGREGATES

Fine Aggregates shall be calcareous or basalt sands, or a combination

thereof. Aggregate for use in grout shall conform to ASTM C 404, with grading in accordance with ASTM D 448, No. 10.

2.4 MORTAR AND GROUT MATERIALS

Portland cement, masonry cement, mortar cement, lime and admixtures shall be stored in such a manner as to prevent deterioration or contamination with foreign matter. Cement which has become caked, partially set or otherwise deteriorated, or any material which becomes damaged or contaminated, shall be rejected.

2.5 ADMIXTURE

If manufactured sands are used in the concrete mix, the Contractor may select and use a water-reducing and/or an air-entraining admixture as specified hereinafter to provide satisfactory workability in the concrete. The cement content of a mix shall be as specified hereinafter, and the use of an admixture shall in no way result in the reduction of the cement factor. Admixture, if used, shall conform to ASTM C 494 or ASTM C 260 and shall be mixed in proper amount in accordance with directions of manufacturer.

2.6 WATER

Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that may be deleterious to concrete or reinforcement. Non-potable water shall not be used.

PART 3 EXECUTION

3.1 DESIGN OF CONCRETE MIXES

- a. Ingredients for tremie concrete grout shall be Portland cement, fine aggregates, admixtures and water. Grout shall have a minimum compression strength of 2500 psi and with 1.0% of cement weight of Pro-Tremie Admixture for underwater placement.
- b. Concrete grout shall be designed so that the concrete materials will not segregate nor cause excessive bleeding.
- c. Tremie admixture shall be applied in strict accordance to the manufacturer's instruction.
- d. The Contractor shall submit the mixes he intends to use at least 14 days before the actual concrete placing operations.

3.2 MIXING GROUT

- a. All grout throughout shall be plant mixture in an approved type of power operated mixer than will ensure uniformity and homogeneity of the grout produced. Contractor shall provide a sufficient number of mixtures to continuously carry on the work.
- b. Ready Mixed and Mixed-In-Transit Concrete shall be mixed to conform to the provisions of ASTM C 94 and as follows:
 1. The plant shall have sufficient capacity and transportation equipment to deliver concrete at the rate desired. The interval

between for a pour shall not exceed 30 minutes.

2. The time elapsed between the introduction of the mixing water to the cement and aggregates or the cement to the aggregates, and the placing of concrete in its final position shall not exceed 90 minutes.

c. Admixtures conforming to Section 2.5 may be used in the concrete as recommended by the supplier.

3.3 PLACEMENT OF CONCRETE GROUT

The Contracting Officer who shall be given one day advance notice of starting time of grout pour.

3.3.1 Grout Under Precast Concrete Panels

a. Preparation:

1. Cushion fill shall be compacted to 95% of its maximum dry density.

2. All precast panels shall be set in place on the leveling frame at exact location and elevations.

3. Rock revetment a toe and sides of ramp shall be set in place prior to grouting.

b. Grout Injection:

1. Tremie grout shall be injected through the preset injection holes in the precast panels from lowest area toward higher elevation. The injection pressure shall be adjusted at the site to produce best results.

2. All voids between the precast panels and the compacted base course shall be filled with grout.

3. Tremie grout injection shall be performed by workers who had successful experience with this type of placement method.

3.3.2 Grout Bags

a. Preparation:

1. Rock revetment under and side of grout bags shall be set in place prior to grouting.

b. Grout Bags:

1. Tremie grout shall be injected from lowest area toward higher elevation. The injection pressure shall be adjusted at the site to produce best results.

2. While concrete grout is still fresh, step on the concrete filled bags until the bags form a shape to fit the surrounding rock revetment.

3. Tremie grout injection shall be performed by workers who had successfully experience with this type of placement method.

3.4 CLEAN UP

Contractor shall clean up all concrete and cement materials, equipment and debris upon completion of any portion of the concrete work and upon completion of the entire concrete and related work.

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SECTION 03410N

PLANT-PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 304R	(1989) Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 309R	(1996) Consolidation of Concrete
ACI 318M/318RM	(1995) Building Code Requirements for Structural Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1996) Carbon Structural Steel
ASTM A 47	(1990) Ferritic Malleable Iron Castings
ASTM A 615/A 615M	(1996; Rev. A) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 33	(1997) Concrete Aggregates
ASTM C 94	(1997) Ready-Mixed Concrete
ASTM C 150	(1997) Portland Cement
ASTM C 260	(1995) Air-Entraining Admixtures for Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 618	(1997) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 989	(1997) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM A 934/A 934M	(1997) Epoxy-Coated Prefabricated Steel Reinforcing Bars

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(1985) Quality Control for Plants and Production of Precast Prestressed Concrete Products
PCI MNL-120	(1992) Design Handbook - Precast and Prestressed Concrete

1.2 PRECAST MEMBERS

The work includes the provision of precast non-prestressed concrete herein referred to as precast members. Precast members shall be the product of a manufacturer specializing in the production of precast concrete members. In the ACI publications, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Contracting Officer.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Drawings of precast members;

SD-03 Product Data

Anchorage and lifting inserts and devices

Bearing pads

SD-04 Samples

Surface finish

Submit two 12 by 12 by 2 inch thick sample panels representative of the color and finish of precast member requiring a finish Grade A surface finish.

SD-05 Design Data

Concrete mix design;

SD-06 Test Reports

Contractor-furnished mix design

Submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Obtain approval before concrete placement.

SD-07 Certificates

Fabrication

Submit quality control procedures established in accordance with PCI MNL-116 by the precast manufacturer.

SD-11 Closeout Submittals

Concrete batch ticket information

1.4 QUALITY CONTROL

1.4.1 Product Quality Control

PCI MNL-116 for PCI enrolled plants. Where panels are manufactured by specialists in plants not currently enrolled in the PCI "Quality Control Program," provide a product quality control system in accordance with PCI MNL-116 and perform concrete and aggregate quality control testing using an approved, independent commercial testing laboratory. Submit test results to the Contracting Officer.

1.5 DELIVERY AND STORAGE

Lift and support precast members at the lifting and supporting points indicated on the shop drawings. Store precast members off the ground. Separate stacked precast members by battens across the full width of each bearing point. Protect from weather, marring, damage, and overload.

1.6 FACTORY INSPECTION

At the option of the Contracting Officer, precast units shall be inspected by the QC Representative prior to being transported to the job site. The Contractor shall give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

1.7 QUALITY ASSURANCE

1.7.1 Drawing Information

Submit drawings indicating complete information for the fabrication, handling, and erection of the precast member. Drawings shall not be reproductions of contract drawings. Design calculations and drawings of precast members (including connections) shall be prepared and sealed by a registered professional engineer, and submitted for approval prior to fabrication. The drawings shall indicate, as a minimum, the following information:

- a. Marking of members for erection
- b. Connections for work of other trades
- c. Location and size of openings
- d. Reinforcing details
- e. Material properties of steel and concrete used
- f. Lifting and erection inserts

g. Dimensions and surface finishes of each member

h. Erection sequence and handling requirements

1.7.2 Concrete Mix Design

Marine concrete as specified in Section 03311 shall be used. Thirty days minimum prior to concrete placement, submit a mix design for the concrete. Include a complete list of materials including type; brand; source and amount of cement, pozzolan, and admixtures; and applicable reference specifications.

1.7.3 Certificates: Record Requirement

ASTM C 94. Submit mandatory batch ticket information for each load of ready-mixed concrete.

PART 2 PRODUCTS

2.1 CONTRACTOR-FURNISHED MIX DESIGN

ACI 318M/318RM. The minimum compressive strength of concrete at 28 days shall be 5000 psi, unless otherwise indicated.

2.2 MATERIALS

2.2.1 Cement

ASTM C 150, Type II. The blended cement shall consist of a mixture of ASTM C 150 cement and one of the following materials: ASTM C 618 pozzolan or fly ash, or ASTM C 989 ground iron blast furnace slag. The pozzolan/fly ash content shall not exceed 25 percent by weight of the total cementitious material. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.2.1.1 Fly Ash and Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Type N and F.

2.2.1.2 Ground Iron Blast-Furnace Slag

ASTM C 989, Grade 100 or 120.

2.2.2 Water

Water shall be fresh, clean, and potable.

2.2.3 Aggregates

2.2.3.1 Aggregates Selection

ASTM C 33, Size 57, except as modified herein. Obtain aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement.

2.2.4 Admixtures

2.2.4.1 Air-Entraining

ASTM C 260.

2.2.4.2 Accelerating

ASTM C 494, Type C or E.

2.2.4.3 Water Reducing

ASTM C 494, Type A, E, or F.

2.2.4.4 Corrosion Inhibitor

2.2.5 Reinforcement

2.2.5.1 Reinforcing Bars

Epoxy coated rebar ASTM A 615/A 615M, Grade 60; ASTM A 934/A 934M.

2.2.6 Metal Accessories

2.2.6.1 Inserts

ASTM A 47, Grade 32510 or 35018.

2.2.6.2 Structural Steel

ASTM A 36/A 36M.

2.3 FABRICATION

PCI MNL-116 unless specified otherwise.

2.3.1 Forms

Brace forms to prevent deformation. Forms shall produce a smooth, dense surface. Chamfer exposed edges of columns and beams 3/4 inch, unless otherwise indicated. Provide threaded or snap-off type form ties.

2.3.2 Reinforcement Placement

ACI 318M/318RM for placement and splicing. Reinforcement may be preassembled before placement in forms. Provide exposed connecting bars, or other approved connection methods, between precast and cast-in-place construction. Remove any excess mortar that adheres to the exposed connections.

2.3.3 Concrete

2.3.3.1 Concrete Mixing

ASTM C 94. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

2.3.3.2 Concrete Placing

ACI 304R, ACI 305R for hot weather concreting, and ACI 309R, unless otherwise specified.

2.3.3.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 50 and 190 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts.

2.3.4 Surface Finish

Repairs located in a bearing area shall be approved by the Contracting Officer prior to repairs. Precast members containing hairline cracks which are visible and are larger than 0.005 inches in width shall be repaired. Precast members which contain cracks greater than 0.02 inches in width shall be approved by the Contracting Officer, prior to being repaired. Any precast member that is structurally impaired or contains honeycombed section deep enough to expose reinforcing shall be rejected.

2.3.4.1 Unformed Surfaces

Provide a floated finish first and provide final V groove finish or steel broom finish as shown on the plan.

PART 3 EXECUTION

3.1 SURFACE REPAIR

Prior to erection, and again after installation, precast members shall be checked for damage, such as cracking, spalling, and honeycombing. As directed by the Contracting Officer, precast members that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" shall be repaired, or removed and replaced with new precast members.

3.2 ERECTION

Precast members shall be erected after the concrete has attained the specified compressive strength, unless otherwise approved by the precast manufacturer. Erect in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Place precast members within tolerances. Align member ends.

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SECTION 03415A

PRECAST-PRESTRESSED CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

- | | |
|--------------|---|
| ACI 211.1 | (1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete |
| ACI 214 | (1977; R 1997) Recommended Practice for Evaluation of Strength Test Results of Concrete |
| ACI 318/318R | (1999) Building Code Requirements for Structural Concrete and Commentary |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------------|---|
| ASTM C 31/C 31M | (2000) Making and Curing Concrete Test Specimens in the Field |
| ASTM C 33 | (2001) Concrete Aggregates |
| ASTM C 39/C 39M | (2001) Compressive Strength of Cylindrical Concrete Specimens |
| ASTM C 150 | (2000) Portland Cement |
| ASTM C 172 | (1999) Sampling Freshly Mixed Concrete |
| ASTM C 231 | (1997) Air Content of Freshly Mixed Concrete by the Pressure Method |
| ASTM C 260 | (2000) Air-Entraining Admixtures for Concrete |
| ASTM C 311 | (2000) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete |
| ASTM C 430 | (1996) Fineness of Hydraulic Cement by the 45-Micrometer (No. 325) Sieve |
| ASTM C 494/C 494M | (1999a) Chemical Admixtures for Concrete |

ASTM C 618	(2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 1069	(1986; R 1997el) Specific Surface Area of Alumina or Quartz by Nitrogen Adsorption

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(1985) Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products
PCI MNL-120	(1992) PCI Design Handbook - Precast and Prestressed Concrete

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Erection

The Contractor shall prepare and submit complete shop drawings that show the precast unit manufacturer's recommended details and materials for the work required by paragraphs DELIVERY, STORAGE, AND HANDLING and ERECTION. The shop drawings shall include: design computations; marking of the units for the placing drawings; anchorages for work of other trades; anchorages to support construction; size and location of steel tendons; methods of stressing; location and sizes of all openings 12 in. wide or larger to be cast into members; formwork; joints between units and other construction; reinforcing steel details; method of curing; and, pickup points and lifting devices.

SD-03 Product Data

Design Calculations

Design calculations shall be submitted prior to the initiation of manufacture of members to be used under this contract.

Concrete Mixture Proportions

Concrete mixture proportions shall be submitted.

Construction Records

Construction records of the manufacturing, handling, and erection of the precast prestressed concrete members shall be submitted.

SD-06 Test Reports

Materials

Certified test reports of required material tests shall be submitted prior to the use of the materials in the work. Reports shall be furnished for each shipment and shall be identified with specific lots.

Concrete

The results of concrete strength testing by the contractor shall be submitted not more than 5 days after the tests are completed.

SD-07 Certificates

Cement
Pozzolan
Air-Entraining Admixture
Water-Reducing Admixture
Aggregates
Silica Fume
Corrosion Inhibitor

Cement, Pozzolan, Air-Entraining Admixture, Water-Reducing Admixture, Aggregates, Silica Fume shall be certified for compliance with all specifications requirements.

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements

1.3.1.1 Precast-Prestressed Members and Connections

Design of members and connections shall be in accordance with ACI 318/318R and PCI MNL-120.

1.3.1.2 Loads

Loadings for members and connections shall include all dead load, live load, applicable lateral loads such as wind and earthquake, applicable construction loads such as handling, erection loads, and other applicable loads.

1.3.1.3 Design Calculations

Design calculations for members and connections not shown in the contract drawings shall be made by a registered professional engineer experienced in the design of precast-prestressed concrete.

1.3.2 Performance Requirements

Perform the following testing to ensure the materials and method used meet the requirements of these specifications and will produce precast-prestressed concrete members which are suitable for their intended use.

1.3.2.1 High-Strength Steel Tendons

Testing shall be as specified in Section 03230 STEEL STRESSING TENDONS AND

ACCESSORIES FOR PRESTRESSED CONCRETE.

1.3.2.2 Concrete

Concrete shall be sampled and cylinders made in accordance with ASTM C 172 and ASTM C 31/C 31M.

a. Concrete Test Cylinders. A minimum of two concrete test cylinders per bed shall be made to verify the strength of concrete at the time of stress transfer and a minimum of two test cylinders per day or 50 cubic yards of concrete or fraction thereof, whichever results in the most cylinders, shall be made for each mix design to verify the attainment of the specified strength.

b. Cylinder Making. Cylinders shall be made as near as possible to the location where they will be cured and shall not be disturbed in any way from 1/2 hour after casting until they are either 24 hours old or ready to be tested. Concrete in cylinders may be consolidated by rodding or by vibration as specified in ASTM C 31/C 31M.

c. Cylinder Curing

(1) Test cylinders shall be cured with similar methods as the members they represent. In lieu of actual curing with the members, cylinders may be cured in curing chambers correlated in temperature and humidity with the beds. In such a case, the correlation shall be constantly verified by use of recording thermometers in the curing chambers and comparison with the temperature records of beds and by use of the same methods of moisture retention for curing chambers and casting beds.

(2) For beds cured by steam or radiant heat, cylinders shall be placed at random points along the bed. If there is any indication of variable heat, cylinders shall be placed in the coolest area.

(3) Test cylinders to indicate compliance with specified 28-day or earlier strength shall remain in the bed with the member until the member is removed. At that time, the cylinders shall be removed from their molds and placed in storage in a moist condition at 73.4 degrees plus or minus 3 degrees F.

d. Testing of Cylinders

(1) Testing of cylinders to determine compressive strength shall be performed in accordance with ASTM C 39/C 39M. The strength of concrete at any given age shall be determined as the average of two cylinders, except a single cylinder test can be used to determine stress transfer strength or predictive strengths at less than 28 days.

(2) Testing machines shall be calibrated in accordance with ASTM C 39/C 39M.

1.3.2.3 Air Content

The air content tests shall be conducted in accordance with ASTM C 231. At least one air content test shall be conducted on the concrete from which each member is cast.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Transportation

1.4.1.1 Transporting Members

In transporting members by truck, or barge, provision shall be made for supporting the members as described above, except battens can be continuous over more than one stack of units, with adequate bracing to ensure their maintaining the vertical position and damping of dangerous vibrations. Trucks with double bolsters are satisfactory provided the members are fully seated on the outer bolsters at not more than 3 feet or the depth of the member from the end and the inner bolster is not more than 8 feet from the end of the member or the designated pickup point. Adequate padding material shall be provided between tie chains or cables to preclude chipping of concrete.

1.4.1.2 Lateral Deflection or Vibration

Any noticeable indication of lateral deflection or vibration during transportation shall be corrected by rigid bracing between members or by means of lateral trussing.

1.4.2 Storage

1.4.2.1 Storage Areas

Storage areas for prestressed members shall be stabilized, and suitable foundations shall be provided, so differential settlement or twisting of members will not occur.

1.4.2.2 Stacked members

Stacked members shall be separated and supported by battens placed across the full width of each bearing point. Battens shall be arranged in vertical planes at a distance not greater than the depth of the member from designated pickup points. Battens shall not be continuous over more than one stack of precast units. Stacking of members shall be such that lifting devices will be accessible and undamaged. The upper members of a stacked tier shall not be used as storage areas for shorter members or equipment.

1.4.3 Handling of Members

The location of pickup points for handling of the members and details of the pickup devices shall be shown in shop drawings. Members shall be handled only by means of approved devices at designated locations. Members shall be maintained in an upright position at all times and picked up and supported as shown in approved shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall comply with the following:

2.1.1 Cement

Cement shall comply with the following:

2.1.1.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type II. The tricalcium aluminate content of the Type II cement shall be limited to 4 or 10 percent.

2.1.1.2 Silica Fume

Silica fume may be furnished as a dry, densified material. Silica fume, a densified material, shall conform to the following requirements:

- a. Silicon dioxide content: 85-percent minimum, test method ASTM C 311.
- b. Loss on ignition: 6.0-percent maximum, test method ASTM C 311.
- c. Surface area, nitrogen adsorption, 15,000 m₂/kg minimum, test method ASTM C 1069.
- d. Oversize, percent retained on 45-micrometer sieve: 5-percent maximum, test method ASTM C 430.

The Contractor shall provide at his expense the services of a manufacturer's technical representative, experienced in mixture proportioning, placement procedures, and curing of concrete containing silica fume. The manufacturer's representative shall be available for consultation by both the Contractor and the Government during mixture proportioning, planning, and production of silica-fume concrete and shall be on site immediately prior to and during at least the first placement of concrete containing silica fume and at other times, if directed.

2.1.2 Pozzolan

Pozzolan shall conform to ASTM C 618 Class F or C.

2.1.3 Other Materials

2.1.3.1 Aggregates

Aggregates shall meet the requirements of ASTM C 33.

2.1.3.2 Admixtures

In no event shall admixtures containing chlorides or nitrates be used in the concrete.

- a. Air-entraining admixture shall be certified to comply with ASTM C 260.
- b. Water-reducing admixture shall be certified to comply with ASTM C 494/C 494M Type A.
- c. Corrosion inhibitor shall be based on manufacturer's recommendations.

2.1.4 Steel Reinforcement

Steel reinforcement shall be in accordance with Section 03201 STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT.

2.1.5 Steel Tendons

Steel tendons shall be in accordance with Section 03230 STEEL STRESSING TENDONS AND ACCESSORIES FOR PRESTRESSED CONCRETE.

2.2 CONCRETE MIXTURE PROPORTIONS

2.2.1 Concrete

Marine concrete as specified in Section 03311 shall be used. Concrete shall be composed of cementitious material, water, fine and coarse aggregate, and admixtures. The cementitious material shall be portland cement and pozzolan where appropriate. The admixtures shall be an air-entraining agent, Silica Fume, Corrosion Inhibitor, and may include a water-reducing admixture when its formulation and use are approved.

2.2.2 Proportions

The concrete mixture proportions shall meet the following requirements:

Maximum Water-cement ratio (w/c) = 0.40.
Specified Strength = 6,000 psi at 28 days.

Air Content = 5 to 7 percent as determined in accordance with ASTM C 231. Proportions shall be selected so that the maximum permitted w/c ratio is not exceeded and so as to produce an average strength exceeding the design strength f'_c by the amount indicated below. Where the production facility has a standard deviation record determined in accordance with ACI 214, based on 30 consecutive strength tests of similar mixture proportions to that proposed, obtained within 1 year of the time when concrete placing is expected, it shall be used in selecting average strength. The average strength used as the basis for selecting proportions shall exceed the specified strength f'_c by at least.

400 psi if standard deviation is less than 300 psi
550 psi if standard deviation is 300 to 400 psi
700 psi if standard deviation is 400 to 500 psi
900 psi if standard deviation is 500 to 600 psi

If the standard deviation exceeds 600 psi or if a standard deviation record is not available, proportions shall be selected to produce an average strength at least 1,200 psi greater than the specified strength.

Mixtures shall be proportioned in accordance with ACI 211.1. The trial mixtures shall be formulated using the same materials as those to be used in the units supplied under this specification, and the selected proportions shall be submitted for approval with the results of cylinder strengths at 28 days.

2.3 EVALUATION AND ACCEPTANCE

2.3.1 Concrete

A test result shall be the average of the strengths of the two test cylinders made in accordance with paragraph SYSTEM DESCRIPTION, subparagraph PERFORMANCE REQUIREMENTS, subparagraph CONCRETE, subparagraph "a", CONCRETE TEST CYLINDERS. The strength level of the concrete will be

considered satisfactory if the average of all sets of three consecutive strength tests equal or exceed the specified strength $f'(c)$ and no individual test falls below the specified value by more than 500 psi. Members manufactured with concrete that does not meet the strength requirements shall be rejected.

2.3.1.1 Air Content

All members cast with concrete having a measured air content less than 5 percent shall be rejected. Members cast with concrete having an air content up to 9 percent may be incorporated into the work if the strength requirements are met.

2.3.2 Tolerances

The precast-prestressed members shall be manufactured within the following tolerances. Members failing to meet the dimensional tolerances shall be rejected.

2.3.2.1 Length of Member

The length of the member shall not deviate from the length shown in the contract drawings by more than plus or minus $3/4$ inch or plus or minus $1/8$ inch per 10 feet of length, whichever is greater.

2.3.2.2 Cross-sectional Dimensions

The cross-sectional dimensions of a member, if less than 36 inches, shall not vary by more than plus or minus $1/4$ inch and, if over 36 inches, they shall not vary by more than plus or minus $3/8$ inch.

2.3.2.3 Horizontal Alignment (Sweep)

The horizontal alignment of the members shall not deviate from a straight line parallel to the theoretical centerline by more than $1/2$ inch or $1/8$ inch per 10 feet of length, whichever is greater. The maximum gap between two adjacent members due to sweep shall not exceed $1/2$ inch.

2.3.2.4 Camber

The actual camber of beams shall not deviate from the computed camber by more than plus or minus $1/8$ inch per 10 feet but not more than plus or minus $1/2$ inch maximum total deviation.

2.3.2.5 Camber Differential

The differential in camber at midspan between adjacent members shall not exceed $1/8$ inch per 10 feet of length or $3/4$ inch maximum.

2.3.2.6 Position of Tendons

The position of the tendons shall not deviate from the design position by more than plus or minus $1/4$ inch.

2.3.2.7 Handling Devices

The actual position of handling devices shall not deviate from the designed position by more than plus or minus 6 inches.

2.3.2.8 Anchors and Inserts

The actual position of anchors and inserts shall not vary by more than plus or minus 1 inch from positions shown in the contract drawings.

2.3.2.9 Flange Thickness

The thickness of a flange or slab shall not vary from the dimensions in the drawings by more than plus 1/4 inch or minus 1/8 inch.

2.3.2.10 Depth of Member at Support

At the supports, the depth of a member shall not deviate from the dimensions shown in the contract drawings by more than plus or minus 1/4 inch.

2.3.2.11 Distance Between Stems

The actual distance between stems shall not deviate from the dimension shown in the contract drawing by more than plus or minus 1/8 inch.

2.3.2.12 Squareness of Ends

The ends of members shall not deviate from being square by more than plus or minus 1/4 inch. Squareness shall be checked in both the vertical and horizontal planes.

2.3.3 Defects

2.3.3.1 Minor Defects

Minor defects are those which involve less than 36 square inches of concrete and do not expose stressing tendons or reinforcing steel. These defects will be repaired as specified hereinafter. Cracks which are visible but are 0.01 inch wide or less will be accepted.

2.3.3.2 Major Defects

Major defects are those which involve more than 36 square inches of concrete or expose stressing tendons or reinforcing steel. If one or more major defects appear in a member, it shall be rejected. Cracks of a width of more than 0.01 inch shall be cause for rejection of the member.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication of precast-prestressed members shall follow the applicable provisions of the PCI MNL-116, except as specified herein.

3.2 BEDS AND FORMS

3.2.1 Casting Beds

All casting beds shall have concrete support on unyielding foundations.

3.2.2 Forms

Forms, both fixed and movable, shall be of steel. All forms and beds shall

be thoroughly cleaned after each use.

3.2.3 Bulkheads

Bulkheads, spacers, templates, and similar equipment having influence on the accuracy of dimensions and alignment shall be regularly inspected and maintained after each casting.

3.2.4 Alignment

Accurate alignment of forms shall be maintained during the casting operation to assure compliances with tolerances specified in paragraph EVALUATION AND ACCEPTANCE. Leakage of the paste in form joints is not acceptable, and measures shall be taken to prevent such leakage. Measures shall also be taken to provide corner chamfers.

3.2.5 Form Ties

For exposed members, form ties, if used, shall be of the threaded or snap-off type so no parts will be left at the surface of the finished concrete.

3.3 TENDONS

The tendons shall be placed, stressed, and destressed in accordance with Section 03230 STEEL STRESSING TENDONS AND ACCESSORIES FOR PRESTRESSED CONCRETE.

3.4 ANCHORAGES FOR POSTTENSIONING

Anchorages for posttensioning tendons will not interfere with the placement of the member such that adequate compaction of the concrete in the anchorage zone is impeded.

3.5 STEEL REINFORCEMENT

Steel bars and welded wire fabric shall be placed in accordance with Section 03201 STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT.

3.6 CONCRETE PLACEMENT

Concrete placement shall be in accordance with Section 03311 MARINE CONCRETE, except that once placement is started in a member it shall be carried on in a continuous operation until the member is completed. Members shall be cast in a horizontal position and casting in tiers will not be permitted. Adequate vibration shall be provided with internal and form vibrators so the cast members shall be free of rock pockets or surface blemishes resulting from inadequate vibration. Cold joints shall not be permitted in prestressed concrete members. If delays occur that result in hardening of the concrete so it will not receive a vibrator and again become plastic, the concrete shall be removed and the forms shall be washed out and refilled, otherwise partially cast members will be rejected.

3.7 CURING AND PROTECTION

Concrete for the manufacturing of the precast-prestressed concrete members shall be cured and protected in accordance with Section 03311 MARINE CONCRETE or by other methods further specified here.

3.7.1 Curing with Steam at Atmospheric Pressure

Steam curing shall be under a suitable enclosure to retain the live steam to minimize moisture and heat losses. The enclosure shall allow free circulation of the steam around the sides and top of the beams. Steam jets shall be so positioned so they do not discharge directly on the concrete, forms, or test cylinders. The cycle of steam application shall conform to the following:

3.7.1.1 Curing After Placing and Vibrating

After placing and vibrating, the concrete shall be allowed to attain its initial set before the steam is applied. During the period between placement of the concrete and application of steam, provisions shall be made to prevent surface drying by means of a coating of membrane curing compound, moist covers, or equally effective methods. Application of the steam shall be delayed not less than 2 hours and not more than 10 hours after the time of concrete placement. If the ambient temperature is below 50 degrees F, enough heat shall be applied to maintain the concrete at its placing temperature.

3.7.1.2 Temperature Increase

The ambient temperature within the casting enclosure shall be increased at a rate not to exceed 40 degrees F per hour. Temperature increase shall be as uniform as possible.

3.7.1.3 Temperature Range

The temperature shall be increased until the ambient temperature in the casting enclosure is between 140 and 160 degrees F. Once this temperature range is reached, it shall be maintained until the concrete has reached the compressive strength necessary for stressing or destressing the tendons.

3.7.1.4 Temperature Decrease

In discontinuing the steam curing, the ambient air temperature shall decrease at a rate not to exceed 40 degrees F per hour. Temperature decrease shall be as uniform as possible.

3.7.1.5 Recording Thermometers

Recording thermometers showing the time-temperature relationship through the curing period from placing concrete to transfer of prestress shall be provided. At least one recording thermometer per casting enclosure shall be used. The desired curing time-temperature relationship shall be placed on the recording chart of the recording thermometer to aid the personnel controlling the temperature during curing. Recording charts shall be made available upon request and shall be clearly visible during the curing process.

3.7.2 Curing with Radiant Heat and Moisture

3.7.2.1 Radiant Heat

Radiant heat may be applied to beds by means of pipe circulating steam, hot oil, or hot water or by electric blankets or heating elements on forms. Pipes, blankets, or elements shall not be in contact with concrete, form surface, or test cylinders.

3.7.2.2 Moisture Loss

During the cycle of radiant heat curing, effective means shall be provided to prevent rapid loss of moisture in any part of the member. Moisture may be applied by a covering of moist burlap or cotton matting. Moisture may be retained by covering the member with a plastic sheet in combination with an insulating cover or by applying a liquid seal coat or membrane curing compound.

3.7.2.3 Temperature Limits

Temperature limits and use of recording thermometer shall be as specified for curing with steam at atmospheric pressure.

3.7.2.4 Termination of Curing

Termination of curing shall be as specified in Section 03311 MARINE CONCRETE unless the concrete has been cured by one of the two methods stated above. Termination of curing for concrete cured by either the steam at atmospheric pressure method or the radiant heat with moisture shall be determined based on the compressive strength of the concrete necessary for stressing or destressing the tendons.

3.8 REPAIRS

All honeycombed areas, chipped corners, air pockets over 1/4 inch in diameter, and other minor defects shall be repaired. Form offsets of fins over 1/8 inch shall be ground smooth. All unsound concrete shall be removed from defective areas prior to repairing. All surfaces permanently exposed to view shall be repaired by a blend of portland cement and white cement properly proportioned so that the final color when cured will be the same as adjacent concrete.

3.9 FINISHING

3.9.1 Unformed surfaces

Unformed surfaces shall receive a wood float finish.

3.9.2 Formed Surfaces

Formed surfaces shall match the texture and color of unformed surfaces.

3.10 ERECTION

Erection shall comply with the following.

3.10.1 Storage Provisions

All provisions for storage and handling given in paragraph DELIVERY, STORAGE, AND HANDLING shall be observed at the erection site.

3.10.2 Seating of Precast Prestressed Concrete Members

The precast prestressed concrete members shall be set into place in a manner which assures full bearing. If the bearing called for in the contract drawing is not obtained, then the members shall be removed and the situation corrected.

3.10.3 Welding

Welding during erection shall be done in accordance with Section 05055a METALWORK FABRICATION, MACHINE WORK AND MISCELLANEOUS PROVISIONS. When welding or burning with a welding electrode, the ground shall be attached directly to the base metal. Under no circumstances shall the member be used as a conductor for the ground.

3.10.4 Erection Plan

The erection plan shall be in sufficient detail so that adequacy of equipment, techniques, and accessories can be determined and comments offered. Acceptance of the Contractor's erection plan shall not relieve the Contractor of his responsibility for erecting precast prestressed members into position as required by the plans and specifications.

3.11 CONSTRUCTION RECORDS

Complete construction records shall be kept of the manufacturing, handling, and erection of the precast-prestressed concrete members. Records shall be kept for, but not limited to, the following items:

- a. Specifications of material used in the manufacture of the members.
- b. Time-temperature history of the concrete members from casting to the transfer of the prestress force.
- c. Records of the tendon stressing operation including initial prestress force, measured elongation, how it was measured, and how the tendons were stressed and destressed.
- d. Records of inspection of the members before and after the prestress force is transferred to the members.
- e. Records of the inspection of the members each time they are moved.
- f. Records of any defects in the member and any corrective measures taken.

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DIVISION 04 - MASONRY

SECTION 04413

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SECTION 04413

STONE PROTECTION (BREAKWATER AND SHORELINE REVETMENT)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- | | |
|--------------|---|
| AASHTO T 27 | (1999) Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates Nineteenth Edition; ASTM C 135-96a; Revised Per Interim Specification - Tests and Methods - 1999 |
| AASHTO T 90 | (2000) Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils Nineteenth Edition; Revised Per Interim Specifications - Test and Methods - 1999 |
| AASHTO T 96 | (1999) Standard Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine Nineteenth Edition: Revised Per Interim Specifications - Tests and Methods - 1999 |
| AASHTO T 176 | (2000) Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test Nineteenth Edition; Revised per Interim Specifications - Tests and Methods - 1999 |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|--|
| ASTM C 33 | (2001) Concrete Aggregates |
| ASTM C 127 | (1988) Specific Gravity and Absorption of Coarse Aggregate |
| ASTM C 144 | (1993) Aggregate for Masonry Mortar |
| ASTM C 150 | (2000) Portland Cement |
| ASTM C 127 | (1988) Specific Gravity and Absorption of Coarse Aggregate |
| ASTM D 75 | (1987; R 1997) Sampling Aggregates |

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Selection of borrow sources and detailed plans for quarry operations

SD-04 Samples

Stone

1.3 SOURCES OF STONE

Stone may be quarried or obtained from other sources as approved. All stones shall meet the requirements specified herein. Development of stone source and improvements of any access to the site shall be at the Contractor's responsibility and expense. The sources from which the Contractor proposes to obtain the material shall be selected well in advance of the time when the stones will be needed in the work. Approval of a source or sources of stone shall not be construed as approval of all material from that source or sources. The right is reserved to reject materials produced from localized areas, zones, or strata when such materials are unsuitable as determined by the Contracting Officer. Any suitable size stone salvaged or recovered from required excavation and meeting the specified requirements may be used in the work.

1.3 SAMPLING AND FIELD TESTING OF STONE

1.3.1 Sampling

Samples of stones from sources proposed by the Contractor shall be taken at locations designated by the Contracting Officer. The samples will be used as standards of the rock quality to be furnished by the Contractor. Duplicate sets of samples shall be taken, numbered, referenced and identified. One set shall remain at the Contractor's quarry (source) for later comparison with actual pieces of rock to be furnished for the project. The second set of samples shall be tested at the Contractor's expense, at the laboratory meeting Government certification criteria. Test results are to be submitted to the Contracting Officer at least 30 days in advance of the time when placement of stone is expected to begin. Sampling, identification, preparation and transportation of samples shall be in accordance with ASTM D 75. All tests and transportation costs shall be paid for by the Contractor.

1.3.2 Field Testing of Stones

Prior to removal from the source, the Contractor shall field test representative rock pieces selected by the Contracting Officer by dropping from a vertical height of ten feet on a solid rock surface or on a bed of comparable size rock proposed for the project. Broken, cracked, or otherwise damaged stones found by dropping will not be acceptable and shall be disposed of by the Contractor at his expense.

1.4 QUARRY AND BORROW OPERATIONS

1.4.1 Quarry and Borrow Areas

The Contractor shall be responsible for obtaining all rights-of-way required in connection with his borrowing and quarrying operations. The Contractor shall obtain from the owners the right to procure materials, pay all charges involved, and bear all expenses of developing the sources, including rights-of-way for hauling. Necessary plant, labor, and materials, for clearing, scraping, disposal, loading, hauling, and all other operations required to obtain the stones and borrow materials shall be provided by the Contractor at no additional cost to the Government. The Contractor shall, at his own expense, maintain all haul roads required for access from the quarry areas to the site of the work and provide additional haul roads as required. The Contractor shall maintain necessary warning signs, and place warning lights between sundown and sunup along roads subject to public traffic. The Contractor shall be responsible for trespassing upon or injury to private lands adjacent to rights-of-way resulting from his actions or those of his employees

1.4.2 Operation Requirement

The Contractor shall submit to the Contracting Officer, within 15 days after receipt of notice to proceed and 30 days before any work in the borrow and quarry areas, plans for the Contractor's borrow and quarry operations. Plans of operation shall include the following:

- a. Selection of quarry-borrow sources.
 - b. Detailed plans for quarry operation including:
 - (1) Maps, descriptions, and plans of proposed road to quarry and borrow sources.
 - (2) Method(s) of excavation.
 - (3) Plans for drainage and restoration after completion of work.
- All operations shall be subject to the approval of the Contracting Officer.

PART 2 PRODUCTS

2.1 STONE

2.1.1 General

All stones shall be dense, durable, and of a suitable quality to insure permanence in the structure and in the climate in which it is to be used. Stones shall be free from cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes. All stones shall be clean and free of deleterious material.

2.1.2 Physical Requirements

Physical properties of the stones shall conform to the following requirements when tested in accordance with the respective ASTM Standards. Acceptance tests shall be performed on individual stone pieces 10 to 30 pounds in weight in lieu of the sizes specified in ASTM C 127. Test

apparatus shall be improvised to accommodate the above stone sizes. All acceptance tests shall be made by and at the expense of the Contractor. Samples of stone shall be furnished as specified in paragraph SAMPLING AND FIELD TESTING OF STONE. Stones removed from the existing breakwater and existing revetment may be reused in new work provided a suitable sampling of stones, as determined by the Contracting Officer, meets general, physical and gradation requirements - including drop testing.

ASTM C 127	Bulk Specific Gravity (Saturated Surface Dry)
	Not less than 2.5.
ASTM C 127	Absorption - Not More than 4 percent.

2.2 CEMENT

Cement shall conform to ASTM C 150, Type II.

2.3 SAND FOR MORTAR

Sand shall conform to ASTM C 33, fine aggregate or to ASTM C 144.

2.4 FILTER MATERIAL

Filter material shall be of hard, tough, durable, lava rock.

If tested according to the designation methods, the aggregate shall meet the requirements below:

Test	Test Method	Requirement
Los Angeles Abrasion	AASHTO T 96 (Grading A)	10% Maximum @ 100 Rev. 40% Maximum @ 500 Rev.
Sand Equivalent	AASHTO T 176	35% Minimum
Plasticity Index	AASHTO T 90	6% Maximum
Grading	AASHTO T 27	Refer to Table 703-VI

TABLE 703-VI - GRADING REQUIREMENTS

Sieve Size	Percentage Passing by Weight
2	100
1-1/2"	90 - 100
3/4	50 - 90
No. 4	15 - 50
No. 200	0 - 5

PART 3 EXECUTION

3.1 EARTHWORK

Excavation and backfilling shall be as specified in Section 02300a EARTHWORK.

3.2 CORE STONE

3.2.1 General

Core stone shall be of the sizes shown on the drawings and shall conform to the requirements of paragraph STONE.

3.2.1.1 Placement

Core material shall be placed to the lines and grades indicated in such a manner as to produce a dense mass of stone. A tolerance of ± 3 inches will be permitted.

3.3 UNDERLAYER STONE

3.3.1 General

Underlayer stone shall be of the sizes shown on the drawings and shall conform to the requirements of paragraph STONE.

3.3.2 Placement

Underlayer stones shall be placed to the lines, grades, and thicknesses indicated. Underlayer stone shall be placed to its full layer thickness in one operation and in such a manner to avoid displacing the underlying material. A tolerance of ± 3 inches will be permitted. The desired distribution of sizes of stones throughout the mass may be obtained by selective loading, controlled dumping of successive loads during placing or by a combination of these methods. Placing stones into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. Placement shall be accomplished without displacement to the underlying material.

3.4 ARMOR STONE

3.4.1 General

Armor stones shall be of the sizes shown on the drawings and conform to the requirements of paragraph STONE.

3.4.2 Placement

3.4.2.1 Armor Stone (One-Stone Thick)

Armor Stone (One-stone thick) shall be placed within the limits and elevations indicated on the drawings to provide a one-stone thickness. Allowable tolerances for slope stones shall be ± 6 inches from the thickness shown. Crest stone tolerance of ± 6 inches from the elevations indicated is allowed. Stones shall be individually keyed and fitted in the structure such that each stone shall be contact with all adjacent stones. Extremes in the indicated tolerances among adjacent stones is not permitted. The size of voids between all stones shall be kept to a minimum to prevent

underlayer material from passing through the voids. Chinking of void spaces using smaller stones is not permitted. Stones shall be generally rectangular in cross section, the least dimension of any stone being not less than one-third its greatest dimension. Armor stones shall be placed on the prepared underlayer surfaces using equipment suitable for handling the sizes indicated without damage to the stones. Placement of the armor stones shall proceed as soon as practicable after the underlayer placement to prevent wave action from displacing the underlayer material.

3.4.2.2 Breakwater Armor Stone (Two-Stone Thick)

Armor stone (two-stone thick) shall be placed within the limits and elevations indicated in such a manner to provide a two-stone thickness subject to a tolerance of +6 inches and -3 inches and result in rough, irregular surfaces with each stone in contact with adjacent stones and irregular surfaces with each stone in contact with adjacent stones and leaving minimum sized voids through which underlaying stones cannot pass. Stones shall be generally rectangular in cross-section, the least dimension of any stone being not less than one-third its greatest dimension. Stones shall be placed by equipment suitable for handling material of the sizes indicated without damage to the stones. Individual stone placement will only be required where stones are not in contact with adjacent stones and where the prescribed thickness is not obtained during the placement operations. Voids between the armor stones shall not be filled with chinking stones. The placement of armor stones shall proceed as soon as practicable after placement of underlayer stones or bedding layer stones to prevent wave actions from displacing the underlayer stones or bedding layer stones.

3.5 CEMENT RUBBLE MASONRY (CRM)

CRM shall consist of all shoreline revetment rocks (as indicated on the drawing) above mean lower low water that are bedded in mortar. Spaces between stones shall also be filled with mortar.

3.5.1 Size

Individual stones other than spalls shall have a thickness of not less than 6 inches and a width of not less than 1-1/2 times the thickness or not less than 12 inches. Each stone shall have a length of not less than 1-1/2 times its width.

3.5.2 Mortar

Mortar shall consist of 1 part Portland cement, 3 parts sand (by volume of cement used), and water. The mortar shall be mixed in a mixer and sufficient water shall be added to produce a workable mix with a trowel. The mortar shall be used in the work within a period of 30 minutes after mixing. Retempering of mortar will not be permitted.

3.5.3 Foundation Preparation

Areas on which cement rubble masonry is to be placed shall be trimmed and dressed to conform to theoretical slope lines and grades indicated. The bottom of cement rubble masonry shall be placed on an undisturbed subgrade.

3.5.4 Placement

Large, flat stones shall be selected and placed for the bottom course on

the prepared base in such manner that adjacent stones are in close contact.

Selected stones, roughly squared and pitched to lines shall be used at all angles and ends of walls. All stones shall be fully bedded in mortar and keyed in, with overlapping joints of at least 6 inches forming a firm bond.

Spaces between the stones shall be filled solid with mortar. Spalls shall not be placed in nests in lieu of larger size stone. A tolerance of plus or minus 3 inches from the slope lines and grades shown on the drawings will be allowed in the finished surface provided either extreme of this tolerance is not continuous over an area greater than 200 square feet. Weep holes shall be provided as indicated on the drawings. After completion of an area, the surfaces shall be protected from rain, flowing water, and mechanical injury.

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DIVISION 05 - METALS

SECTION 05055A

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SECTION 05055A

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASME INTERNATIONAL (ASME)

ASME BPVC SEC IX (1995) Boiler and Pressure Vessel Code;
Section IX, Welding and Brazing
Qualifications

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

AWS D1.2 (1990) Structural Welding Code - Aluminum

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

Detail drawings for metalwork and machine work shall be submitted prior to fabrication.

SD-03 Product Data

Welding of Structural Steel

Schedules of welding procedures for steel structures shall be submitted prior to commencing fabrication.

Structural Steel Welding Repairs

Welding repair plans for steel shall be submitted prior to making repairs.

Materials Orders

Copies of purchase orders, mill orders, shop orders and work orders for materials shall be submitted prior to the use of the materials in the work.

Materials List

Materials list for fabricated items shall be submitted at the time of submittal of detail drawings.

Shipping Bill

Shipping bill shall be submitted with the delivery of finished pieces to the site.

SD-06 Test Reports

Tests, Inspections, and Verifications

Certified test reports for materials shall be submitted with all materials delivered to the site.

SD-07 Certificates

Qualification of Welders and Welding Operators

Certifications for welders and welding operators shall be submitted prior to commencing fabrication.

1.3 DETAIL DRAWINGS

Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings.

1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

The Contractor shall certify that the qualification of welders and welding operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with the requirements of AWS D1.1, Section 5, or ASME BPVC SEC IX, Section IX, prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for which qualified within the preceding three months. The Contractor shall require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Materials Orders

The Contractor shall furnish 6 copies of purchase orders, mill orders, shop orders and work orders for all materials orders and items used in the work.

Where mill tests are required purchase orders shall contain the test site address and the name of the testing agency.

2.1.2 Materials List

The Contractor shall furnish a materials list of the materials to be used in the fabrication of each item.

2.2 FABRICATION

2.2.1 Structural Fabrication

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

2.2.1.1 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

2.2.1.2 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be

exposed or visible shall be chipped, ground or machined to sound metal.

2.2.2 Welding

2.2.2.1 Welding of Structural Steel

a. Welding Procedures for Structural Steel - Welding procedures for structural steel shall be prequalified as described in AWS D1.1, Subsection 5.1 or shall be qualified by tests as prescribed in AWS D1.1, Section 5. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish a welding procedure as prequalified. For welding procedures qualified by tests, the test welding and specimen testing must be witnessed and the test report document signed by the Contracting Officer. Approval of any welding procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these specifications. The Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Contractor Officer. The Contractor shall submit a complete schedule of welding procedures for each steel structure to be welded. The schedule shall conform to the requirements specified in the provisions AWS D1.1, Sections 2, 3, 4, 7 and 9 and applicable provisions of Section 10. The schedule shall provide detailed procedure specifications and tables or diagrams showing the procedures to be used for each required joint. Welding procedures must include filler metal, preheat, interpass temperature and stress-relief heat treatment requirements. Each welding procedure shall be clearly identified as being prequalified or required to be qualified by tests. Welding procedures must show types and locations of welds designated or in the specifications to receive nondestructive examination.

b. Welding Process - Welding of structural steel shall be by an electric arc welding process using a method which excludes the atmosphere from the molten metal and shall conform to the applicable provisions of AWS D1.1, Sections 1 thru 7, 9, 10 and 11. Welding shall be such as to minimize residual stresses, distortion and shrinkage.

c. Welding Technique

(1) Filler Metal - The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1, Subsection 4.5 to maintain low moisture of low hydrogen electrodes.

(2) Preheat and Interpass Temperature - Preheating shall be performed as required by AWS D1.1, Subsection 4.2 and 4.3 or as otherwise specified except that the temperature of the base metal shall be at least 70 degrees F. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

(3) Stress-Relief Heat Treatment - Where stress relief heat treatment is specified or shown, it shall be in accordance with the requirements of AWS D1.1, Subsection 4.4 unless otherwise authorized or directed.

d. Workmanship - Workmanship for welding shall be in accordance with AWS D1.1, Section 3 and other applicable requirements of these specifications.

(1) Preparation of Base Metal - Prior to welding the Contractor shall inspect surfaces to be welded to assure compliance with AWS D1.1, Subsection 3.2.

(2) Temporary Welds - Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed for permanent work. Temporary welds shall be made using low-hydrogen welding electrodes and by welders qualified for permanent work as specified in these specifications. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 120 degrees F in any case. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces after serving its purpose.

(3) Tack Welds - Tacks welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

PART 3 EXECUTION

3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Disassembly, cleaning and lubrication will not be required except where necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts except high strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

3.2 TESTS

3.2.1 Workmanship

Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications for the item of work being furnished.

3.2.2 Production Welding

Production welding shall conform to the requirements of AWS D1.1 or AWS D1.2 as applicable. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production items (flat, vertical, overhead or sloping). Test and production stud welding will be subjected to visual examination or inspection. If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

-- End of Section --

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DIVISION 05 - METALS

SECTION 05500A

MISCELLANEOUS METAL

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SECTION 05500A

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2001) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2002) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 240	(1996a) Heat-Resisting Chromium and Chromium-Nickle Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM A 53/A 53M	(2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2000) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924/A 924M	(1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(2000) Structural Welding Code - Steel
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Miscellaneous Metal Items

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall

include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings for the following items: Location and details of bolts and inserts, and guardrail and handrail details.

SD-04 Samples

Miscellaneous Metal Items.

Samples of the following items: Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, with concrete, mortar, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for

steel; and lag bolts and screws for the plastic lumber fender.

1.7 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

PART 2 PRODUCTS

2.1 ANCHOR BOLTS, NUTS, WASHERS AND SCREWS

Anchor bolts, nuts, washers, screws, and other necessary hardware for installation of the plastic wood fender shall be stainless steel Type 316 (ASTM A 240), allowable tensile stress of 20,000 psi, and allowable shear stress of 1150 psi.

2.2 STEEL PIPE ACCESSORIES

Steel pipes and accessories supporting the precast panels for the launching ramp shall conform to ASTM A 53/A 53M, Type S, Grade B, galvanized. All open ends of the pipe shall be closed with seal, welded 1/4 inch plate. All other steel shapes, angles and plates shall be as shown on the plans and conforms to the requirements of ASTM A 36, hot-dip galvanized after fabrication. Bolts, nuts and washers shall be stainless steel Type 316 (ASTM A 240).

2.3 WELDING ELECTRODES AND RODS

Electrodes shall be E70XX and conform to AWS D1.1.

PART 3 EXECUTION

3.1 WORKMANSHIP

a. Use materials of size and thickness as shown, or, if not shown, of required size and thickness to produce the strength and durability in finished product. Work to dimension and product or accepted on shop drawings using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

b. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

c. Provide for anchorage of type shown, coordinate with supporting structure. Fabricate all anchoring devices to provide adequate support for indented use.

d. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar materials.

e. Items indicated to be galvanized shall be hot-dip galvanized in accordance with ASTM A 123/A 123M and ASTM A 153/A 153M.

f. Welding to or on structural steel shall be in accordance with AWS D1.1.

-- End of Section --

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DIVISION 16 - ELECTRICAL

SECTION 16375A

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-- End of Section Table of Contents --

SECTION 16375A

ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C119.1	(1986; R 1997) Sealed Insulated Underground Connector Systems Rated 600 Volts
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2001) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2002) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus
ASTM B 3	(1995) Soft or Annealed Copper Wire
ASTM B 8	(1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1997) National Electrical Safety Code
IEEE Std 100	(1997) IEEE Standard Dictionary of Electrical and Electronics Terms
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1) \ \$31.00\$ \ F

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 467	(1993; Rev thru Apr 1999) Grounding and Bonding Equipment
UL 486A	(1997; Rev thru Dec 1998) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486B	(1997; Rev Jun 1997) Wire Connectors for Use with Aluminum Conductors
UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit

1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.2.2 Service Conditions

Items provided under this section shall be specifically suitable for the following service conditions.

- a. Fungus Control
- b. Altitude 5 feet
- c. Ambient Temperature 95 degrees F
- d. Frequency 60 HZ
- e. Ventilation
- f. Seismic Parameters
- g. Humidity Control
- h. Corrosive Areas

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Electrical Distribution System

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity

with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components are assembled, function together and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall consist of the following:

- a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. All optional items shall be clearly identified as included or excluded.

- b. Internal wiring diagrams of equipment showing wiring as actually provided for this project. External wiring connections shall be clearly identified.

Detail drawings shall as a minimum depict the installation of the following items:

- a. Service equipment support details.

As-Built Drawings

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction.

The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within 10 calendar days from the time the drawings are returned to the Contractor.

SD-03 Product Data

Nameplates

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material and Equipment

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

General Installation Requirements

Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment.

SD-06 Test Reports

Factory Tests

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

Field Testing

A proposed field test plan, 30 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Operating Tests

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The condition specified for the test.
- f. The test results, signed and dated.

g. A description of adjustments made.

SD-07 Certificates

Material and Equipment

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements.

The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced.

1.5 EXTRA MATERIALS

Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 NAMEPLATES

2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal. As a minimum, nameplates shall be provided for circuit breakers and meters.

2.3 CORROSION PROTECTION

2.3.1 Ferrous Metal Materials

2.3.1.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M and ASTM A 123/A 123M.

2.3.1.2 Equipment

Equipment and component items not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 480 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

2.4 CABLES

2.4.1 Low-Voltage Cables

Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70, and must be UL listed for the application or meet the applicable section of either ICEA or NEMA standards.

2.4.1.1 Conductor Material

Underground cables shall be annealed copper complying with ASTM B 3 and ASTM B 8. Aluminum conductors shall not be permitted.

2.4.1.2 Insulation

Insulation must be in accordance with NFPA 70, and must be UL listed for the application or meet the applicable sections of either ICEA, or NEMA standards.

2.4.1.3 In Duct

Cables shall be single-conductor cable, in accordance with NFPA 70.

2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

2.5.1 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A and UL 486B.

Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

2.6 CONDUIT AND DUCTS

Ducts shall be single, round-bore type, with wall thickness and fittings suitable for the application.

2.6.1 Nonmetallic Ducts

2.6.1.1 Concrete Encased Ducts

UL 651 Schedule 40 and Schedule 80

2.6.2 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of plastic ducts; metallic conduits or conduit coatings; concrete or masonry; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.7 HANDHOLES

Handholes shall be as indicated. Strength of handholes, and their frames and covers shall conform to the requirements of IEEE C2. Handhole covers in sidewalks, and turfed areas shall be of the same material as the box.

2.8 GROUNDING AND BONDING

2.8.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 10 feet in length. Sectional type rods may be used.

2.8.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors

shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

2.9 CONCRETE AND REINFORCEMENT

Concrete work shall have minimum 3000 psi compressive strength.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02316a EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Concrete work shall have minimum 3000 psi compressive strength.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

3.2 CABLE INSTALLATION

3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

3.2.1.2 Duct Cleaning

Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times or until less than a volume of 8 cubic inches of debris is expelled from the duct.

3.2.1.3 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance

with lubricant manufacturer's recommendations.

3.2.1.4 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch as required. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manilla rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 50 degrees F temperature for at least 24 hours before installation.

3.2.2 Duct Line

Cables shall be installed in duct lines where indicated. Cable splices in low-voltage cables shall be made in handholes only, except as otherwise noted. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

3.3 DUCT LINES

3.3.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be between handholes. Long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used.

3.3.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.3.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70. Duct line encasements shall be monolithic construction. At any point, tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

3.3.4 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the

manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.3.4.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.4 HANDHOLES

Handholes shall be located approximately as shown. Handholes shall be of the type noted on the drawings and shall be constructed in accordance with the details shown.

3.5 CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS

Connections between aerial and underground systems shall be made as shown. Underground cables shall be extended up poles in conduit to cable terminations. Conduits shall be secured to the poles by 2-hole stainless steel pipe straps spaced not more than 5 feet apart and with 1 strap not more than 12 inches from any bend or termination. Conduits shall be equipped with bushings to protect cables and minimize water entry.

3.6 GROUNDING

3.6.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.
- b. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be up to three, 10 feet rods spaced a minimum of 10 feet apart. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.6.2 Grounding and Bonding Connections

Connections shall be made by a fusion-welding process.

3.6.3 Grounding and Bonding Conductors

Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.7 FIELD TESTING

3.7.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 30 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

3.7.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.7.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode - 25 ohms.
- b. Multiple rod electrodes - 25 ohms.

3.7.4 Low-Voltage Cable Test

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations of conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$$

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

3.8 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation,

material or operation have been corrected.

-- End of Section --

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SECTION 16403A

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SECTION 16403A

MOTOR CONTROL CENTERS, SWITCHBOARDS AND PANELBOARDS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 187 (1994) Copper Bar, Bus Bar, Rod and Shapes

ASME INTERNATIONAL (ASME)

ASME B1.1 (1989) Unified Inch Screw Threads (UN and UNR Thread Form)

ASME B1.20.1 (1983; R 1992) Pipe Threads, General Purpose (Inch)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches

NEMA PB 1 (1990) Panelboards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1993) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 50 (1992) Enclosures for Electrical Equipment

UL 67 (1993; Rev thru May 1994) Panelboards

UL 489 (1991; Rev thru Dec 1994) Molded Case Circuit Breakers and Circuit Breaker Enclosures

1.2 SYSTEM DESCRIPTION

These specifications include the design, fabrication, assembly, wiring, testing, and delivery of the items of equipment and accessories and spare parts listed in the Schedule and shown on the drawings.

1.2.1 Rules

The equipment shall conform to the requirements of NFPA 70 unless more

stringent requirements are indicated herein or shown. NEMA rated and UL listed equipment has been specified when available. Equipment must meet NEMA and UL construction and rating requirements as specified. No equivalent will be acceptable. The contractor shall immediately notify the Contracting Officer of any requirements of the specifications or contractor proposed materials or assemblies that do not comply with UL or NEMA. International Electrotechnical Commission (IEC) rated equipment will not be considered an acceptable alternative to specified NEMA ratings.

1.2.2 Coordination

The general arrangement of the motor control centers, switchboards and panelboards is shown on the contract drawings. Any modifications of the equipment arrangement or device requirements as shown on the drawings shall be subject to the approval of the Contracting Officer. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. All equipment shall be completely assembled at the factory. The motor control centers and switchboards may be disassembled into sections, if necessary, for convenience of handling, shipping, and installation.

1.2.3 Standard Products

Material and equipment shall be standard products of a manufacturer regularly engaged in their manufacture and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. All materials shall conform to the requirements of these specifications. Materials shall be of high quality, free from defects and imperfections, of recent manufacture, and of the classification and grades designated. All materials, supplies, and articles not manufactured by the Contractor shall be the products of other recognized reputable manufacturers. If the Contractor desires for any reason to deviate from the standards designated in these specifications, he shall, after award, submit a statement of the exact nature of the deviation, and shall submit, for the approval of the Contracting Officer, complete specifications for the materials which he proposes to use.

1.2.4 Nameplates

Nameplates shall be made of laminated sheet plastic or of anodized aluminum approximately 1/8 inch thick, engraved to provide white letters on a black background. The nameplates shall be fastened to the panels in proper positions with anodized round-head screws. Lettering shall be minimum 1/2 inch high. Nameplate designations shall be in accordance with lists on the drawings, and as a minimum shall be provided for the following equipment:

Panelboards

Equipment of the withdrawal type shall be provided with nameplates mounted on the removable equipment in locations visible when the equipment is in place.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings
Shop Drawings

The Contractor shall, within 30 calendar days after date of award, submit six (6) copies of outline drawings of all equipment to be furnished under this contract, together with weights and overall dimensions. Drawings shall show the general arrangement and overall dimensions of the panelboards. These drawings shall show space requirements and provisions for conduits.

Panelboards

The Contractor shall, within 30 calendar days after date of award, submit six (6) copies of electrical equipment drawings. A single-line diagram, equipment list and nameplate schedule shall be provided for each panelboard.

SD-03 Product Data

Equipment

The Contractor shall within 30 calendar days after date of award submit six (6) copies of such descriptive cuts and information as are required to demonstrate fully that all parts of the equipment will conform to the requirements and intent of the specifications. Data shall include descriptive data showing typical construction of the types of equipment proposed, including the manufacturer's name, type of molded case circuit breakers performance capacities and other information pertaining to the equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

The equipment shall be shipped as completely assembled and wired as feasible so as to require a minimum of installation work.

1.5 MAINTENANCE

1.5.1 Accessories and Tools

A complete set of accessories and special tools unique to equipment provided and required for erecting, handling, dismantling, testing and maintaining the apparatus shall be furnished by the Contractor.

1.5.2 Spare Parts

Spare parts shall be furnished as specified below. All spare parts shall be of the same material and workmanship, shall meet the same requirements, and shall be interchangeable with the corresponding original parts furnished.

- a. 2 - Fuses of each type and size.
- b. 4 - One quart containers of finish paint for indoor equipment.
- c. 2 - One quart containers of the paint used for the exterior surfaces of outdoor equipment.

PART 2 PRODUCTS

2.1 CONNECTIONS

All bolts, studs, machine screws, nuts, and tapped holes shall be in accordance with ASME B1.1. The sizes and threads of all conduit and fittings, tubing and fittings, and connecting equipment shall be in accordance with ASME B1.20.1. All ferrous fasteners shall have rust-resistant finish and all bolts and screws shall be equipped with approved locking devices. Manufacturer's standard threads and construction may be used on small items which, in the opinion of the Contracting Officer, are integrally replaceable, except that threads for external connections to these items shall meet the above requirements.

2.2 MOLDED CASE CIRCUIT BREAKERS

Molded case circuit breakers shall conform to the applicable requirements of NEMA AB 1 and UL 489. The circuit breakers shall be manually-operated, shall be quick-make, quick-break, common trip type, and shall be of automatic-trip type unless otherwise specified or indicated on the drawings. All poles of each breaker shall be operated simultaneously by means of a common handle. The operating handles shall clearly indicate whether the breakers are in "On," "Off," or "Tripped" position. Personnel safety line terminal shields shall be provided for each breaker. The circuit breakers shall be products of only one manufacturer, and shall be interchangeable when of the same frame size.

2.2.1 Trip Units

Except as otherwise noted, the circuit breakers, of frame sizes and the trip unit ratings as shown on the drawings, shall be provided with combination thermal and instantaneous magnetic trip units. The Government reserves the right to change the indicated trip ratings, within frame limits, of the trip devices at the time the shop drawings are submitted for approval. The breaker trip units shall be interchangeable and the instantaneous magnetic trip units shall be adjustable on frame sizes larger than 150 amperes. Nonadjustable instantaneous magnetic trip units shall be set at approximately 10 times the continuous current ratings of the circuit breakers.

2.2.2 120/240-Volt AC Circuits

Circuit breakers for 120-volt ac circuits shall be rated not less than 120/240 or 240 volts ac, and shall have a UL listed minimum interrupting capacity of 10,000 symmetrical amperes.

2.3 PANELBOARDS

Panelboards shall consist of assemblies of molded-case circuit breakers with buses and terminal lugs for the control and protection of branch circuits to motors, heating devices and other equipment operating at 480 volts ac or less. Panelboards shall be UL 67 labeled. "Loadcenter" type panels are not acceptable. Panelboards shall be designed for installation in surface-mounted cabinets accessible from the front only, as shown on the drawings. Panelboards shall be fully rated for a short-circuit current of 10,000 symmetrical amperes RMS ac.

2.3.1 Enclosure

Enclosures shall meet the requirements of UL 50. All cabinets shall be fabricated from sheet stainless steel of not less than No 10 gage with full seam-welded box ends. Cabinets shall be painted in accordance with paragraph PAINTING. Outdoor cabinets shall be of NEMA 3R raintight and conduit hubs welded to the cabinet. Front edges of cabinets shall be form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front. All cabinets shall be so fabricated that no part of any surface on the finished cabinet shall deviate from a true plane by more than 1/8 inch. Finished-head cap screws shall be provided for mounting the panelboard fronts on the cabinets. Enclosure shall have nameplates in accordance with paragraph NAMEPLATES. Directory holders, containing a neatly typed or printed directory under a transparent cover, shall be provided on the inside of panelboard doors.

2.3.2 Buses

All panelboards shall be of the dead-front type with buses and circuit breakers mounted on a plate or base for installation as a unit in a cabinet. All buses shall be of copper. Copper bars and shapes for bus conductors shall conform to the applicable requirements of ASTM B 187. The sizes of buses and the details of panelboard construction shall meet or exceed the requirements of NEMA PB 1. Suitable provisions shall be made for mounting the bus within panelboards and adjusting their positions in the cabinets. Terminal lugs required to accommodate the conductor sizes shown on the drawing, shall be provided for all branch circuits larger than No. 10 AWG. A grounding lug suitable for 1/0 AWG wire shall be provided for each panelboard.

2.3.3 Components

Each branch circuit, and the main buses where so specified or shown on the drawings, shall be equipped with molded-case circuit breakers having overcurrent trip ratings as shown on the drawings. The circuit breakers shall be of a type designed for bolted connection to buses in a panelboard assembly, and shall meet the requirements of paragraph MOLDED CASE CIRCUIT BREAKERS. Circuit breakers of the same frame size and rating shall be interchangeable.

2.4 PAINTING

Interior and exterior steel surfaces of equipment enclosures shall be thoroughly cleaned and then receive a rust-inhibitive phosphatizing or equivalent treatment prior to painting. Exterior surfaces shall be free from holes, seams, dents, weld marks, loose scale or other imperfections. Interior surfaces shall receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice. Exterior surfaces shall be primed, filled where necessary, and given not less than two coats baked enamel with semigloss finish. Equipment located indoors shall be ANSI Light Gray. All touch-up work shall be done with manufacturer's coatings as supplied under paragraph SPARE PARTS.

2.5 FACTORY TESTS

Each item of equipment supplied under this contract shall be given the manufacturer's routine factory tests and tests as specified below, to insure successful operation of all parts of the assemblies. All tests

required herein shall be witnessed by the Contracting Officer unless waived in writing, and no equipment shall be shipped until it has been approved for shipment by the Contracting Officer. The Contractor shall notify the Contracting Officer a minimum of 14 days prior to the proposed date of the tests so that arrangements can be made for the Contracting Officer to be present at the tests. The factory test equipment and the test methods used shall conform to the applicable NEMA Standards, and shall be subject to the approval of the Contracting Officer. Reports of all witnessed tests shall be signed by witnessing representatives of the Contractor and Contracting Officer. The cost of performing all tests shall be borne by the Contractor and shall be included in the prices bid in the schedule for equipment.

2.5.1 Panelboards Tests

Each panelboard shall be assembled with cabinet and front to the extent necessary to check the fit and provisions for installing all parts in the field. Each panelboard shall be given a dielectric test in accordance with NEMA PB 1. All circuit breakers shall be operated to check mechanical adjustments. All doors and locks shall be checked for door clearances and fits and the performance of lock and latches.

PART 3 EXECUTION (Not Applicable)

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SECTION 16528A

EXTERIOR LIGHTING INCLUDING SECURITY AND CCTV APPLICATIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO LTS-4	(2001; 2002 Interim) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
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AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C78.1350	(1990) Electric Lamps - 400-Watt, 100-Volt, S51 Single-Ended High-Pressure Sodium Lamps
ANSI C80.1	(1995) Rigid Steel Conduit - Zinc Coated
ANSI C82.4	(1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)
ANSI C119.1	(1986; R 1997) Sealed Insulated Underground Connector Systems Rated 600 Volts
ANSI C136.2	(1996) Luminaires, Voltage Classification of Roadway Lighting Equipment
ANSI C136.3	(1995) Roadway Lighting Equipment-Luminaire Attachments
ANSI C136.6	(1997) Roadway Lighting Equipment - Metal Heads and Reflector Assemblies - Mechanical and Optical Interchangeability
ANSI C136.9	(1990) Roadway Lighting - Socket Support Assemblies for Use in Metal Heads - Mechanical Interchangeability
ANSI C136.10	(1996) Roadway Lighting- Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing

ANSI C136.11	(1995) Multiple Sockets for Roadway Lighting Equipment
ANSI C136.15	(1997) Roadway Lighting, High Intensity Discharge and Low Pressure Sodium Lamps in Luminaires -

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2000) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA RP-8	(1983; R 1993) Roadway Lighting
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INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1997) National Electrical Safety Code
IEEE C136.13	(1987; R 1997) Metal Brackets for Wood Poles
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1997) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 6	(1993) Industrial Control and Systems, Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 6	(1997) Rigid Metal Conduit
UL 44	(1999) Thermoset-Insulated Wires and Cables
UL 467	(1993; Rev thru Apr 1999) Grounding and Bonding Equipment
UL 486A	(1997; Rev thru Dec 1998) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 514B	(1996; Rev Oct 1998) Fittings for Conduit

and Outlet Boxes

UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit
UL 854	(1996; Rev Oct 1999) Service-Entrance Cables
UL 1029	(1994; Rev thru Dec 1997) High-Intensity-Discharge Lamp Ballasts
UL 1572	(1995; Rev thru Nov 1999) High Intensity Discharge Lighting Fixtures

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Lighting System
Detail Drawings

Detail drawings for the complete system and for poles, lighting fixtures, arms, handholes. Drawings shall include design calculations showing adequate strength of screw foundations. Data shall include:

- a. Lighting layout.
- b. Isolux patterns.
- c. Average light levels
- d. Uniformity ratios
- e. Aiming diagram

As-Built Drawings

Final as-built drawings shall be finished drawings on mylar or vellum and shall be delivered with the final test report.

SD-03 Product Data

Equipment and Materials

Data published by the manufacturer of each item on the list of equipment and material, to permit verification that the item proposed is of the correct size, properly rated or applied, or is otherwise suitable for the application and fully conforms to the requirements specified.

Spare Parts

Spare parts data for each item of material and equipment specified, after approval of detail drawings for materials and equipment, and not later than 4 months before the date of beneficial occupancy. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and sources of supply.

SD-06 Test Reports

Operating Test

Test procedures and reports for the Operating Test. After receipt by the Contractor of written approval of the test procedures, the Contractor shall schedule the tests. The final test procedures report shall be delivered after completion of the tests.

Ground Resistance Measurements

The measured resistance to ground of each separate grounding installation, indicating the location of the rods, the resistance of the soil in ohms per millimeter and the soil conditions at the time the measurements were made. The information shall be in writing.

SD-10 Operation and Maintenance Data

Lighting System

A draft copy of the operation and maintenance manuals, prior to beginning the tests for use during site testing. Final copies of the manuals as specified bound in hardback, loose-leaf binders, within 30 days after completing the field test. The draft copy used during site testing shall be updated with any changes required, prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the field test shall include modifications made during installation checkout and acceptance.

1.3 SYSTEM DESCRIPTION

1.3.1 Lighting System

The lighting system shall be configured as specified and shown. The system shall include all fixtures, hardware, poles, cables, connectors, adapters and appurtenances needed to provide a fully functional lighting system.

1.3.2 Design Requirements for Lighting

The Lighting system shall be configured as specified and shown. Equipment shall conform to NFPA 70 and IEEE C2. The lighting configuration shall provide sufficient light as specified. The system shall include all

fixtures, hardware, poles, cables, connectors, adapters, and appurtenances needed to provide a fully functional lighting system.

1.3.3 Electrical Requirements

The equipment shall operate from a voltage source as shown, plus or minus 10 percent, and 60 Hz, plus or minus 2 percent.

1.3.4 Interface Between Lighting System and Power Distribution

Conductors shall include all conductors extending from the load side of the power panel.

1.3.5 Nameplates

Each major component of equipment shall have a nonferrous metal or engraved plastic nameplate which shall show, as a minimum, the manufacturer's name and address, the catalog or style number, the electrical rating in volts, and the capacity in amperes or watts.

1.3.6 Standard Products

Materials and equipment shall be standard products of manufacturer regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.4 CORROSION PROTECTION

1.4.1 Aluminum Materials

Aluminum shall not be used except for light fixtures specified herein.

1.4.2 Ferrous Metal Materials

1.4.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M and ASTM A 123/A 123M.

1.4.3 Finishing

Surfaces not otherwise specified and finish painting of items only primed at the factory, shall be painted with two coats of two-part epoxy paint.

PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 BRACKET ARMS

2.2.1 On Steel Poles

Poles shall be provided with bracket arms of the support arm style and of the length indicated on drawings. Bracket arms shall conform to the design of the pole provided. The bracket arms shall be capable of supporting the equipment to be mounted on it with the maximum wind loading encountered at the site. Strength of bracket arms shall be in accordance with IEEE C136.13. Steel brackets shall be galvanized.

2.2.2 Floodlight Brackets

Floodlight brackets shall be coordinated with the floodlight support provided.

2.3 CABLE

The Contractor shall provide all wire and cable. Wire and cable components shall be able to withstand the jobsite environment for a minimum of 20 years.

2.3.1 Insulated Cable

Cable shall be type USE conforming to UL 854, with copper conductors and type RHW or XHHW insulation conforming to UL 44, and shall include green ground conductor. Cable shall be provided with insulation of a thickness not less than that given in column A of TABLE 15.1 of UL 854. Cable shall be rated 600 volts. Parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded.

2.4 CABLE SPLICES AND CONNECTORS

Cable splices and connectors shall conform to UL 486A. Underground splices and connectors shall also conform to the requirements of ANSI C119.1.

2.5 HANDHOLES

Handholes shall be as indicated. Strength of handholes and their frames and covers shall conform to the requirements of IEEE C2. Handholes for low voltage cables installed in parking lots, sidewalks, and turfed areas shall be from an aggregate consisting of sand and with continuous woven glass strands having an overall compressive strength of at least 10,000 psi and a flexural strength of at least 5,000 psi. Handhole covers in parking lots, sidewalks, and turfed areas shall be of the same material as the box. Concrete handholes shall consist of precast reinforced concrete boxes, extensions, bases, and covers. A sufficient number of tamperproof bolts shall be installed to hold the cover firmly in place along the entire surface of contact; a tool for the tamperproof bolts shall be furnished.

2.6 CONDUIT, DUCTS AND FITTINGS

2.6.1 Conduit, Rigid Steel

Rigid steel conduit shall conform to ANSI C80.1 and UL 6.

2.6.2 Conduit Fittings and Outlets

2.6.2.1 Fittings for Conduit and Outlet Boxes

UL 514B.

2.6.2.2 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

2.6.3 Non-Metallic Duct

Non-metallic duct lines and fittings utilized for underground installation shall be suitable for the application. Duct shall be thick-wall, single, round-bore type. Material of one type shall be used. Schedule 40 and 80 polyvinyl chloride (PVC) shall conform to UL 651. Plastic utility duct and fittings manufactured without a UL label or listing shall be provided with a certification as follows: "The materials are suitable for use with 167 degree F wiring. No reduction of properties in excess of that specified for materials with a UL label or listing will be experienced if samples of the finished product are operated continuously under the normal conditions that produce the highest temperature in the duct."

2.7 GROUND RODS

Ground rods shall be of copper clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into earth.

2.8 POLES

Metal poles shall be the pole manufacturer's standard design for supporting the number of fixtures indicated. Poles shall be designed for a wind velocity of 100 mph at the base of the pole, for a wind gust factor of 1.3, and for the height and drag factors recommended by AASHTO LTS-4. The effective projected area of luminaires and other pole-mounted devices shall be taken into account in pole design. Poles shall have grounding provisions. The type of pole shaft material provided shall not be mixed on any project. Grounding connection shall be provided near the bottom of each metal pole and at each concrete pole anchor base. Scratched, stained, chipped, or dented poles shall not be installed.

2.8.1 Steel Poles

Steel poles shall be hot-dip galvanized in accordance with ASTM A 123/A 123M.

Poles shall have tapered tubular members, either round in cross-section or polygonal. Pole shafts shall be one piece. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, length, and a loading tree. Attachment requirements shall be provided as indicated, including grounding provisions. Climbing facilities are not required. Bases shall be of the anchor bolt-mounted type.

2.8.2 Anchor Bolts

Anchor bolts shall be the pole manufacturer's standard, but not less than necessary to meet the pole wind loading, herein and other specified design

requirements.

2.9 ELECTRICAL ENCLOSURES

The Contractor shall provide metallic enclosures as needed. Enclosures shall conform to NEMA ICS 6 and NEMA 250. Enclosures shall be provided with lockable or padlock handles. The enclosures shall be as specified or as shown on the drawings.

2.9.1 Corrosion Resistant Enclosures

Enclosures shall meet the requirements of a NEMA 4X enclosure as defined in NEMA 250.

2.10 ILLUMINATION

2.10.1 General Lighting

Luminaires, ballasts, lamps, and control devices required for general area lighting, including floodlighting shall be as shown.

2.11 LAMPS AND BALLASTS, HIGH INTENSITY DISCHARGE (HID) SOURCES

2.11.1 High-Pressure Sodium

Lamps shall conform to ANSI C78.1350. Ballasts shall conform to ANSI C82.4, or UL 1029. High-pressure sodium lamps shall be clear.

2.12 LUMINAIRE COMPONENTS

Luminaire components shall conform to the following: attachments, ANSI C136.3; voltage classification, ANSI C136.2; field identification marking, ANSI C136.15; interchangeability, ANSI C136.6 and ANSI C136.9; and sockets, ANSI C136.11.

2.13 LIGHTING CONTROL EQUIPMENT

2.13.1 Photo-Control Devices

Photo-control devices shall conform to ANSI C136.10. Each photo-control element shall be a replaceable, weatherproof, plug-in or twist-lock assembly adjustable operation range of approximately 0.5 to 5.0 foot-candles. Luminaires shall be equipped with weatherproof plug-in or twist-lock receptacle to receive the photo-control element.

2.14 PHOTOMETRIC DISTRIBUTION CLASSIFICATION

Photometrics shall conform to IESNA RP-8.

2.15 LUMINAIRES, FLOODLIGHTING

2.15.1 HID

HID lighting fixtures shall conform to UL 1572.

2.16 FIXTURES

Fixtures shall be as shown.

2.16.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

2.16.2 In-Line Fuse

An in-line fuse shall be provided for each fixture, and shall consist of a fuse and a UL approved waterproof fuse holder rated at 30 amperes, 600 volts, with insulated boots. Fuse rating shall be 600 volts.

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall install all system components, including government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, IEEE C2, and contract documents, and shall furnish necessary hardware, fixtures, cables, wire, connectors, interconnections, services, and adjustments required for a complete and operable system.

3.1.1 Current Site Conditions

The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Government. The Contractor shall not take any corrective action without written permission from the Government.

3.2 ENCLOSURE PENETRATIONS

Enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions.

3.3 CABLE INSTALLATION

Cable and all parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded. Each circuit shall be identified by means of fiber or nonferrous metal tags, or approved equal, in each handhole and at each terminal.

3.3.1 Splices

Splices below grade shall be made with nonpressure-filled resin systems using transparent, interlocking, self-venting, longitudinally split plastic molds. Splices above grade shall be made with sealed insulated pressure connectors and shall provide insulation and jacket equal to that of the cable. In order to prevent moisture from entering the splice, jackets shall be cut back to expose the required length of insulation between the jacket and the tapered end of the insulation.

3.3.2 Installation in Duct Lines

Ground and neutral conductors shall be installed in duct with the associated phase conductors. Cable splices shall be made in handholes only.

3.4 DUCT LINES

3.4.1 Requirements

Numbers and size of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high point may be at a terminal, a handhole, or between handholes. Short radius manufactured 90 degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inches in diameter, and 36 inches for duct 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells when duct lines terminate in handholes.

3.4.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and shall match factory tapers. A coupling recommended by the duct manufacturer shall be used when an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.4.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. At any point, tops of concrete encasements shall not be less than the cover requirements listed in NFPA 70.

3.4.4 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendation for the particular type of duct and coupling selected and as approved.

3.4.4.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4 turn to set the joint tightly.

3.4.5 Concrete

Concrete work shall be as specified in Section 03311 MARINE CONCRETE. Duct line encasement shall be of monolithic construction with plain concrete, 3000 psi at 28 days. Where a connection is made to an existing duct line, the concrete encasement shall be well bonded or doweled to the existing encasement.

3.5 HANDHOLES

The exact locations shall be determined after carefully considering the locations of other utilities, grading, and paving. Exact locations shall be approved before construction is started.

3.5.1 Construction

Handholes shall be constructed as indicated on drawings, including appurtenances. In paved areas, the top of entrance covers shall be flush with the finished surface of the paving. In unpaved areas, the top of entrance covers shall be approximately 1/2 inch above the finished grade. Where finished grades are in cut areas, unmortared brick shall be installed between the top of handhole and entrance frame to temporarily elevate the entrance cover to existing grade level. Where duct lines enter walls, the sections of duct may be cast in the concrete or may enter the wall through a suitable opening. The openings around entering duct lines shall be caulked tight with lead wool or other approved material.

3.5.2 Appurtenances

The following appurtenances shall be provided for each handhole.

3.6 POLE INSTALLATION

Pole lengths shall provide a luminaire mounting height of 43 feet. Electrical cabling shall be provided to the light pole as shown. The mount interfaces shall have ac power connected, and the pole wiring harness shall be connected to the luminaire. Pole installation shall conform to the manufacturer's recommendations, NFPA 70, and IEEE C2. Poles shall be set straight and plumb.

3.6.1 Pole Brackets

Brackets shall be installed as specified by the manufacturer and as shown on drawings. Mounting hardware shall be sized appropriately to secure the mount, luminaire, and housing with wind loading normally encountered at the site. Pole brackets for floodlights shall have the number of tenons indicated, arranged to provide the indicated spread between each tenon. Where indicated on drawings, adjustable heads shall be installed on the brackets to position the luminaires. Identical brackets shall be used with one type of luminaire.

3.6.2 Concrete Foundations

Concrete foundations shall have anchor bolts accurately set in the foundation using a template supplied by the pole manufacturer. Once the concrete has cured, the pole shall be set on the foundation, leveled on the foundation bolts, and secured with the holding nuts. The space between the foundation and the pole base shall be grouted. Concrete and grout work shall conform to Section 03311 MARINE CONCRETE. Concrete shall be 3000 psi at 28 days.

3.6.3 Steel Pole Installation

Poles shall be mounted on cast-in-place foundations. Concrete poles shall be embedded in accordance with the details shown. Conduit elbows shall be provided for cable entrances into pole interiors.

3.6.3.1 Cast-In-Place Foundations

Concrete foundations, sized as indicated, shall have anchor bolts accurately set in foundations using templates supplied by the pole manufacturer. Concrete work and grouting is specified in Section 03311 MARINE CONCRETE. After the concrete has cured, pole anchor bases shall be set on foundations and leveled by setting anchor bases on leveling nuts and grouting. Poles shall be set plumb. Anchor bolts shall be the manufactures standard, and not less than necessary to meet the pole wind loading and other specified design requirements.

3.7 LIGHTING

3.7.1 Lamps

Lamps of the proper type, wattage, and voltage rating shall be delivered to the project in the original containers and installed in the fixtures just before completion of the project.

3.7.2 Fixture Installation

Fixtures shall be installed as detailed. Illustrations shown on the drawings are indicative of the general type desired and are not intended to restrict selection of fixtures to any particular manufacturer. Fixtures of similar design, equivalent light-distribution and brightness characteristics, and equal finish and quality will be acceptable as approved.

3.7.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be installed as required for proper installation.

3.7.2.2 In-Line Fuses

An in-line fuse shall be provided for each fixture.

3.8 LIGHTING CONTROL SYSTEM

3.8.1 Photo-Control

Lighting luminaires shall be individually controlled by photo-control elements mounted on the luminaires.

3.9 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following. Grounding conductors shall be soft-drawn, stranded copper. Ground rods shall be driven into the earth so that after the installation is complete, the top of the ground rod will be approximately 1 foot below finished grade.

3.9.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground rod shall not exceed 25 ohms under normally dry conditions. Whenever the required ground resistance is not met, additional electrodes shall be

provided interconnected with grounding conductors, to achieve the specified ground resistance. The additional electrodes shall be up to three, 10 feet long rods spaced a minimum of 10 feet apart, driven perpendicular to grade. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

3.9.2 Items to be Grounded

Ground conductors, metallic conduits, junction boxes, and noncurrent-carrying metallic parts of equipment shall be grounded. Connections above grade shall be made with solderless connectors, and those below grade shall be made by a fusion-welding process.

3.9.3 Lighting Pole

One ground rod shall be provided at each pole. Bases of metal or concrete lighting poles shall be connected to ground rods by means of No. 8 AWG bare copper wire.

3.10 TESTS

3.10.1 Testing

The Contractor shall perform site testing and adjustment of the completed area lighting system. The Contractor shall perform the testing as specified. The Contractor shall provide personnel, equipment, instrumentation, and supplies necessary to perform testing. Written notification of planned testing shall be given to the Government at least 14 days prior to the test; notice shall not be given until after the Contractor has received written approval of the specific test procedures. Test procedures shall explain, in detail, step-by-step actions and expected results demonstrating compliance with the requirements of the specification. Test reports shall be used to document results of the tests. Reports shall be delivered to the Government within 7 days after completion of each test.

3.10.2 Operating Test

After the installation is completed and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements specified. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish instruments and personnel required for the test.

3.10.3 Ground Resistance Measurements

The resistance to ground shall be measured by the fall-of-potential method described in IEEE Std 81.

The contractor shall maintain a separate set of drawings, elementary diagrams and wiring diagrams of the lighting to be used for "as-built" drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the lighting system. In addition to being complete and accurate, this set of drawings shall be kept neat and shall not be used for installation purposes. Upon completion of the

as-built drawings, a representative of the Government will review the as-built work with the Contractor. If the as-built work is not complete, the Contractor will be so advised and shall complete the work as required.

-- End of Section --